Darling Quarter

Network Operator's Water Quality Plan

Rev 5

January 2014

VEOLIA WATER

Solutions & Technologies

DOCUMENT REVISION SUMMARY & DISTRIBUTION

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Revision Summary

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-	27May10	Review	First draft	I Fernandez Rousselot	C Mangion	NA
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Distribution

Rev No	Issued To	Organisation	Position	Remarks / Restrictions
A-0WIP	Internal	VWS	Strategic In-Putters	Strategic Group only
4	External	Auditor	NA	IPART auditor
5	Internal and External	IPART & Auditors	Review and Update	IPART, Auditors, Operations Team

Note the only controlled copy is that electronic version located on J drive of the VWS server.

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Front Cover
Artist impression of Darling Quarter
1-25 Harbour Street Sydney NSW

1 Purpose

The Water Quality Plan (WQP or Plan) has been prepared by Veolia Water Solutions Technologies (Australia) Pty Ltd (VWS) for the Darling Quarter RWTP, 1-25 Harbour Street Sydney NSW as part of VWS's obligation under its NSW Network Operator's Licence No. 10_008 granted by the Minister for Water under section 10 of the Water Industry Competition Act 2006 on 24 June 2010 for the following specified water industry infrastructure (the Infrastructure):

- Infrastructure used for the production, treatment, filtration, storage, or conveyance of non-potable water.

This Plan describes the non-potable water quality integrity of the water infrastructure having regard to defined guidelines, the purposes for which water is used and the purposes for which water is not used.

2 Background

In February 2010 VWS was awarded a contract by BLL to design, supply, construct and commission a Water Recycling Plant (RWTP) to produce 166kL per day of recycled water, the detailed design and construction of which is provided in the Infrastructure Operating Plan (refer) and includes the following summary components and unit processes:

- Receipt of sewage from the local Sydney Water Corporation (SWC) sewer main,
- Grease Removal System,
- Solids Screening System including macerating pumps,
- Proprietary Moving Bed Bioreactor (MBBR) System,
- Proprietary Membrane Bioreactor (MBR) System,
- Reverse Osmosis,
- Ultra Violet Light (UV) and Chlorine Disinfection Systems, and
- Ancillary tanks, pumps, piping, electrics, instrumentation and controls

Also in February 2010 VWS applied to IPART for a Retail Supplier's Licence pursuant to the Water Industry Competition Act 2006 (Act). The Retail Supplier's Licence No 10_009R was also granted by the Minister of Water 24 June 2010.

3 The infrastructure construction

The Infrastructure described in Section 1 and elaborated upon in Section 2 is presented diagrammatically in Appendix 3 and comprises the following scope split by the developer (BLL) and the Licensee (VWS).

3.1 By Developer, BLL

BLL had sole responsibility for the design and construction of the following:

- Gravity sewerage infrastructure for sewage conveyance from the SWC 450mm vitreous clay sewer main under Harbour Street; (refer sewer mining agreement between Sydney Water and Australian Prime Property Fund (APPF) the owner of the Darling Quarter development),
- The sewerage conveyance infrastructure to and including the waste collection sump and connections back to the main sewer; (refer trade waste agreement between Sydney Water and APPF) ,
- Odour Extraction system,
- The treated water storage tanks including outlet connections, and
- The non-potable (treated) water piping infrastructure within the development.

3.2 By the Licensee and Supplier, VWS

VWS was responsible for the design and construction of the following Infrastructure under contract to BLL.

- WTP Feed pumps
- Grease removal and solids screening system,
- MBBR,
- MBR,
- Reverse Osmosis,
- UV and Chlorine (sodium hypochlorite) disinfection
- Odour control, and
- Ancillary pumps, piping, electrics, instrumentation and controls.

4 Scope of this plan

4.1 Scope included

This plan has been prepared pursuant to the Water Industry Competition (General) Regulation 2008 (the Regulation) Schedule 1 (Conditions for Network operators' licences) Part 2 (Additional conditions for licences for Water infrastructure) section 7 (Water quality plans). Accordingly the scope of this Plan addresses the prescriptive requirements of the Regulation (clause by clause) and the IPART Audit Guidelines (September 2009) as follows which have been logically categorised as follows in line with good AS/NZS ISO 9001:2008 Quality management principles.

- Planning,
- Implementation and
- Compliance.

Planning

1. This plan addresses the following in relation to the water supplied from the infrastructure that specifies:
   a) *this Regulation clause (drinking water) not applicable*, and
   b) if the water so supplied is non-potable water, how the 12 elements of the framework for the management of recycled water quality and use, as detailed in the Australian Guidelines for Water Recycling (AGWR1), have been addressed and will be implemented and, having regard to those guidelines, the purposes for which the water may be used and the purposes for which the water may not be used.
2. *This Regulation clause (drinking water) not applicable*, and

3. A water quality plan in relation to water infrastructure for non-potable water must be consistent with

the Australian Guidelines for Water Recycling.

Implementation

The Licencee (VWS)

a) must ensure that its water quality plan is fully implemented and kept under regular review and, in particular, that all of its activities are carried out in accordance with that plan, and
b) must, if the Minister so directs, amend its water quality plan in accordance with the Minister's direction.

Compliance

If the Minister or IPART so demands, or if any significant change is made to its water quality plan, the licensee:

a) must provide the Minister or IPART with a report, prepared by an approved auditor in such manner and form as the Minister or IPART may direct, as to the adequacy of the plan, or
b) must pay the Minister's or IPART's costs of conducting an investigation into the adequacy of the plan.

4.2 Scope not included

This Plan does not cover quality of drinking water for Darling Quarter; this is responsibility of others. This Plan does not address the management of recycle water at the termination point of supply to the Customer; this is the responsibility of the customer (eg Cooling Tower maintenance).

5 Other conditions under Licence

Schedule B under Network Operator's Licence No 10_008 prescribes a comprehensive list of standard conditions which the Minister has determined to impose pursuant to section 13(1)(b) of the Water Industry Competition Act 2006 as well as those obligations imposed by the Regulation (refer Sections 8&9 below):

- B1 - Ongoing capacity to operate,
- B2 - Obtaining appropriate insurance,
- B3 - Maintaining appropriate insurance,
- B4 - Complying with NWS Health requirements,
- B5 - Reporting in accordance with the Reporting Manual,
- B6 - Reporting information in relation to the Register of Licences
- B7 - Monitoring
- B8 - Provision of copy of Plans,
- B9 - Delineating responsibilities – interconnections

6 Other conditions under Regulation

In addition to this Plan the licensee (VWS) must meet the following conditions under Regulation, Schedule 1 Parts 1, 2 & 3 and to which VWS commits to meeting as applicable to its licence requirements or unless directed otherwise by IPART or the Minister:

- Part 1 Licence conditions of all licences
  1. Provision of information,
  2. Commercial operation of water or sewerage infrastructure,
  3. Safe and reliable network,
  4. Environmental protection, and
  5. Codes of conduct.

- Part 2 Additional conditions for licences for water infrastructure
  6. Infrastructure operating plans,
  7. Water quality plan (plan),
  8. Water meters,
  9. Drinking water (not applicable/not used),
  10. Non-potable water,
  11. Customer connections, and
  12. Matters to be contained on the licensee's website.

7 Codes of conduct

VWS commits to complying with any water industry code of conduct, marketing code of conduct and transfer code of conduct that may be applicable to its Network Operator's Licence.

The table below details the requirements of stakeholders regarding primary interfaces and actions:

Schedule B9 – Delineating responsibilities - interconnections	
(a) Responsibility for the repair, replacement or maintenance of any pipes, pumps, valves, storages or other infrastructure connecting the water industry infrastructure specified in Schedule A clause 1, Table 2 of this Licence to any other water industry infrastructure,	As per the Sewer Mining Agreement (SMA) between Lend Lease Funds Management Limited (LLFML) and Sydney Water Corporation (SWC), LLFML has full maintenance responsibility for the extraction and discharge points constructed by them. VWS has full maintenance responsibility for the RWTP infrastructure. SWC owns and maintains the sewer main.
(b) Responsibility of the water quality	The SMA states (4.4) that SWC has no control, nor responsibility, regarding the volume, quantities and quality of the sewerage extracted.
(c) Liability in the event of the unavailability of water.	The SMA states SWC has no liability in the event of the unavailability of the sewerage extracted. Potable water from SWC water main can be used in case of infrastructure failure.
(d) Liability in the event of infrastructure failure.	Potable water from SWC water main in lieu of treated water can be used in case of infrastructure failure.
(e) Responsibility for the handling of customer complaints	LLFML c/o JLL is VWS's only bulk non-potable water customer but there is no connection point, the discharge is direct to the storage tank.

8 Security Note

Regarding availability of information on the VWS website, this will be restricted to information that does not jeopardise VWS intellectual property rights or indeed put the RWTP within Darling Quarter at risk with respect to security.

9 Relationship with other plans under Regulation

This Plan forms part of a suite of plans required under the Regulation as part of VWS's obligations as both a Network Operator (this requirement) and a Retail Supplier (not part of this Licence requirement) in relation to the water Infrastructure as follows.

Network Operator's Licence (2 plans)

1. Infrastructure Operating Plan (IOP) pursuant to the Regulation Schedule 1, Part 2, Section 6 and describes the design, construction, operation and maintenance of the water infrastructure and its integrity,

2. Water Quality Plan (WQP) pursuant to the Regulation Schedule 1, Part 2, Section 7 and describes the non-potable water quality integrity of the water infrastructure having regard to defined guidelines (AGWR1), the purposes for which water is to be used and for which water is not used (this plan).

Retail Supplier's Licence

3. Retail Supply Management Plan (RSMP) for water supply pursuant to the Regulation, Schedule 2 Part 2 (Additional conditions for licences for water supply) Section 8, (Retail Supply Management Plans) which describes the arrangements the licensee has made or proposes to make in relation to the events and circumstances that could adversely affect its ability to supply water, the probability of such occurrences and the measures taken to prevent or mitigate the effect of such circumstances and the arrangement for alternative water supplies).

10 Stakeholders

This Plan refers to stakeholders, namely those persons, entities and authorities that have an interest in the Treatment Infrastructure and its supply of services under licence. These stakeholders are listed below noting all have been regularly updated in the development as applicable.

Stakeholders

Stakeholder	Role
Australian Prime Property Fund (APPF) managed by Lend Lease Developments	Owner of the development and the built infrastructure. Also known as Lend Lease Funds Management Limited (LLFM).
City of Sydney Council	Local council authority.
Jones Lang LaSalle (JLL)	Asset Management and Operations of the built infrastructure and VWS's Single Customer for receiving water.
Public and DQ resident community	Users of Recycled Water
Metropolitan Water, Department of Finance & Services	Administers the WIC Act
Office of Water within the Primary Industries, Food and Water area of the Department of Trade and Investment, Regional Infrastructure and Services (NSW Trade and Investment)	Administers the Water Act and Water Management Act
Independent Pricing and Regulatory Tribunal (IPART)	The independent economic regulator for NSW. Reports to Minister of Water in relation to WICA licence approval and ongoing audit and regulation of licensed activities.
Minister for Finance and Services	WICA Licence Approver.
Dept of Health Office of Environment & Heritage	Administers environmental and water legislation other than WICA including noise and air quality (odour); Previously Department of Environment Climate Change and Water (DECCW)
NSW Office of Water (NOW)	Administers the Water Act and Water Management Act
Energy and Water Ombudsman of NSW (EWON)	Manages complaints (except for water pricing) which the Licensee has not handled to the satisfaction of the complainant and has referred the complainant to EWON.
Sydney Water (SWC)	Supplier of sewage and potable water when Infrastructure off-line
Veolia Water Solutions & Technologies (Australia) Pty Ltd (VWS)	Design and Construct that part of the Treatment Infrastructure that treats sewage to produce treated water. Also known as the Supplier and the Network Operator
Interfacing Contractors	Development and maintenance including cooling tower, toilet, irrigation, landscape and associated interfacing services

11 Methodology

From Section 4.1 above the VWS methodology has been logically categorised accordingly to the 12 elements of the Australian Guidelines for Water Recycling (AGWR1) to which it refers:

- Element 1 – Commitment to responsible use and management of recycled water
- Element 2 – Assessment of the recycled water system
- Element 3 – Preventive measures for recycled water management
- Element 4 – Operational procedures and process controls
- Element 5 – Verification of recycled water quality and environmental performance
- Element 6 – Management of incidents and emergencies
- Element 7 – Operator, contractor and end user awareness and training
- Element 8 – Community Involvement and awareness
- Element 9 – Validation, research and development
- Element 10 – Documentation and reporting
- Element 11 – Evaluation and audit
- Element 12 – Review and continuous improvement

It is clear for the above and by reference to Section 9 above that there is the potential for duplication in addressing certain of these above elements with respect to the companion plans required under regulation. The following are notable:

- Element 3 – Preventative measures; also addressed in detail in the RSMP
- Element 4 – Operational procedures and process controls; addressed in detail in the IOPs
- Element 7 – Operator, contractor and end user awareness and training; addressed in the IOPs
- Element 9 – Validation; also addressed in the IOPs
- Elements 10, 11 and 12 – addressed in all Plans as required under regulation and VWS certification.

12 Planning – the 12 elements for recycled water

12.1 Element 1 Commitment to responsible use and management of recycled water quality

Components:
- Responsible use of Recycled Water
- Regulatory and formal requirements
- Partnerships and engagement of stakeholders
- Recycled water policy

12.1.1 Responsible use of recycled water

Summary actions:
- Involve agencies (ie stakeholders) with responsibilities and expertise in protection of public and environmental health.
- Ensure that design, management and regulation of recycled water schemes is undertaken by agencies and operators with sufficient expertise.

Relevant agencies
This Plan refers to stakeholders, namely those persons, entities and authorities that have an interest in the RWTP and its supply of water under licence. Stakeholders are listed in Section 10 above.

Ensure that agencies have sufficient expertise
VWS has the relevant qualification, competences, and experience in water recycling and is committed to responsible use of recycled water.

VWS has over 20 years experience in the field of reuse with participation in over 100 reuse projects worldwide, ranging from partial potable substitution (Western Corridor, QLD), to golf course irrigation (Brampton Island reuse plant, QLD) to reuse for industry (Illawarra Wastewater Strategy (NSW) and Kwinana (WA)). VWS is the design and build contractor for the Rosehill-Camellia, (Fairfield NSW) recycled water project.

VWS has won many awards for innovative and successful water reuse solutions in USA, Australia and South Africa: our most recent award being for Masterfoods recycling plant in NSW. This was the GWI (Global Water Intelligence) award for innovation awarded in May 2010.

VWS R&D department has achieved world leadership focusing on multiple barrier protection including membrane filtration, ozone, ultraviolet light and chlorine have resulted in an impressive portfolio of VWS technologies and process solutions.

Importantly VWS has been granted the following licences for the Darling Quarter water industry infrastructure demonstrating that VWS has the capability, expertise and capacity to convey and treat sewage and to produce and retail recycled water to meet all regulation and condition.

- Network Operator‘s licence No 10_008
- Retail Supplier‘s licence No 10_009R

These Licences are conditional upon all related WICA Plans being in place and accepted by IPART.

12.1.2 Regulatory and formal requirements

Summary actions:
- Identify and document all relevant regulatory and formal requirements
- Identify governance of recycled water schemes for individual agencies, designers, installers, operators, maintainers, owners and users of recycled water.
- Ensure that responsibilities are understood and communicated to designers, installers, maintainers, operations employees, contractors and end users.
- Review requirements periodically, to reflect any changes

Regulatory and formal requirements
This plan is developed and will be updated to fulfil the requirements of the Australian Guidelines for Water Recycling (AGWR) and the following regulation:

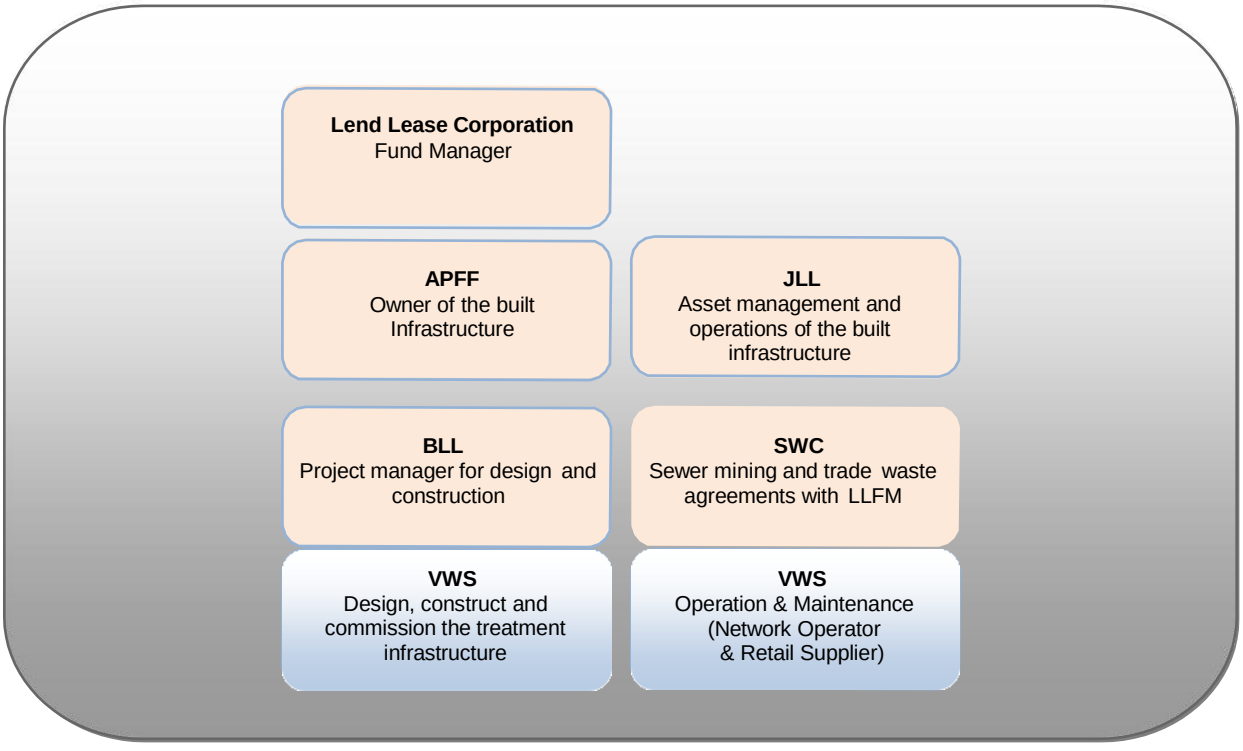
- Federal, state and territory, and local government legislation and regulations:
  - Water Industry Competition Act 2006
  - Water Industry Competition (General) Regulation 2008
  - Water Industry Competition (Access to Infrastructure Services) Regulation 2007
  - NSW Local Government Act 1993 – Section 68 requires approval from the local council for water supply, sewerage and stormwater drainage work as well as the installation and operation of a sewage management system, including private recycled water schemes that process sewage.
  - NSW Local Government (General) Regulation 2005 - Provides detail on the approval as well as the broad performance standards and other criteria for the operation of a recycled water scheme.
  - NSW Environmental Planning and Assessment Act 1979 – Defines and regulates planning and development within NSW and sets out the development approval process and approvals required.
  - NSW Environmental Planning and Assessment Regulation 2000
  - NSW Public Health Act 1991 – NSW Health has responsibilities under the Act for monitoring and managing public health risks and improving public health through regulation, health promotion and other public health measures. NSW Health plays a key role in setting water quality compliance values for recycled water and must be informed of any incident that poses a risk to public health.

- NSW Protection of the Environment Operations (POEO) Act 1997 – States that it is an offence to pollute waters, or permit waters to be polluted except where that pollution occurs in compliance with an environment protection licence. Other offences relating to land, air (including odour) and noise pollution are covered in the POEO Act.
- NSW Work Health and Safety (WHS) Act 2011 – Applies to employers where workplaces use recycled water and also to supplies of recycled water to workplaces.
- NSW Plumbing and Drainage Code (AS/NZS 3500) - This code provides the framework for plumbing work involving recycled water.

- Operating licences and agreements:
  - Network Operator's licence No 10_008
  - Retail Supplier's licence No 10_009R
- Recycled water use agreements and contracts
  - Five year Operations & Maintenance (including supply) Contract between VWS and JLL expiring 21st November 2016.
- Industry standards and codes of practice
  - Applicable Australian and International standards for design and construction
  - Customer complaint code of conduct
  - Debt recovery code of conduct

Governance for individual agencies, operators, owners and users of recycled water

The Stakeholder table in Section 10 outlines the governance of the Darling Quarter Infrastructure, namely the responsibilities and duties of each individual stakeholder. Summary contract arrangements shown below:



Communicate responsibilities
VWS has signed contracts with JLL for the operation and maintenance of the RWTP Scheme. Responsibilities and communication follow standard contractual and commercial practices.

Review
This Plan is reviewed and maintained in accordance with our Document Management (Control) procedure in IMS (PR-QMS-001).

12.1.3 Partnerships and engagement of stakeholders (including the public)

Summary actions:

- Identify all agencies with responsibilities for water resources and use of recycled water; regularly update the list of relevant agencies.
- Establish partnerships with agencies or organisations as necessary or where this will support the effective management of recycled water schemes.
- Identify all stakeholders (including the public) affecting, or affected by, decisions or activities related to the use of recycled water.
- Engage users of recycled water; ensure responsibilities are identified and understood.
- Develop appropriate mechanisms and documentation for stakeholder commitment and involvement

Identify agencies with responsibilities and regularly update list
Relevant agencies include:

- IPART
- NOW
- Department of Health (DoH)
- DECCW
- WorkCover
- EWON
- JLL
- APPF
- Sydney Water Corporation (SWC).
- Other Stakeholders noted in Section 10.

Partnerships
Partnerships indicate the establishment and implementation of mutual objectives between contracted and non-contracted parties. It follows that VWS will actively seek to work cooperatively with all stakeholders and agencies detailed in the above sections to common ends.

Identify stakeholders and the development of mechanisms for their commitment and involvement
See Section 10 above for list of stakeholders. Necessarily under contract and Regulation VWS will develop formal communication with its stakeholders; other forums will be developed over time as the Darling Quarter development grows including working groups and the like as might be required.

Engage users and develop mechanisms for involvement
This requirement is directed to public support before project implementation. Notwithstanding, VWS is bound by Regulation and its own Vision & Values to engage with users in a positive way to promote the safe use of recycled water. Refer Elements 7 and 8.

12.1.4 Recycled Water Policy

Summary actions:
Develop a recycled water policy, endorsed by senior managers, to be implemented within an organisation or by participating agencies.

Ensure that the policy is visible and is communicated, understood and implemented by employees and contractors

Development of policy championed and signed off on by VWS Managing Director

Veolia Water Solutions & Technologies (VWS) is committed to helping its customers and society to prepare for their future water needs, to build the water services of tomorrow and manage these on a long-term basis. For each challenge we build on our field-proven experience to offer economically, environmentally and socially sustainable solutions. To this end VWS provides recycled water management systems to commercial, municipal and industrial customers that:

- Recognise and comply with all relevant legislation, codes and guidelines,
- Protect public and environmental health,
- Show a commitment to responsible use of recycled water,
- Have been developed using a risk management approach,
- Use the latest technology available in the market place and within the VWS portfolio, and adopt a multiple barrier approach to recycled water management,
- Are built on the wealth of knowledge within VWS on recycled water management,
- Are regularly improved and updated as technology and management systems are improved and refined within the VWS group,
- Promote clear and targeted two way communication and education with all stakeholders, customers, employees, users of recycled water and the wider community in relation to recycled water schemes,
- Include regular and reliable monitoring of critical control points and reliable and effective reporting through plant start up, verification and ongoing operation,
- Include risk management and incident response capability during design, construction and operation of the recycled water schemes,
- Will be efficiently operated, with a focus on reducing operating costs, carbon footprint and impact on environment,
- Will be well maintained and offer a clean and safe working environment for operating and maintenance staff,
- Have clearly defined interfaces, roles and responsibilities for all scheme stakeholders, and
- Are consistent with the Australian Guidelines for Water Recycling and cover the 12-elements of the framework for recycled water quality management and use.

Achievement of our commitment is facilitated through our good Corporate Governance principles and practices and the application of our BSI Global certified Integrated Management System which is founded on the relevant Australian and International standards for Occupational Health & Safety (AS/NZS 4801:2001), Environmental (AS/NZS ISO 14001:2004) and Quality (AS/NZS ISO 9001:2008) Management Systems.

Compliance with the policy

The VWS Water Quality Policy is highly visible by the way of display with VWS other corporate policies and is available to all employees, understood and implemented for all recycle water projects and contracts.
The policy will be made available to our stakeholders via VWS internet webpage.

12.2 Element 2 - Assessment of the recycled water system

Components:
- Intended uses and source of recycled water
- Recycled water system analysis
- Assessment of water quality data
- Hazard Identification and risk assessment

12.2.1 Source of recycled water, intended uses, receiving environments & routes of exposure

Summary actions:
- Identify source of water.
- Identify intended uses, routes of exposure, receiving environments, endpoints and effects.
- Consider inadvertent or unauthorised uses.

Identify source of water – raw municipal sewage

The raw sewage is extracted from the SWC 450mm vitreous clay sewer main under Harbour Street. The catchment area has been identified as residential, commercial and retail, with no significant industrial loading. APPF will have in place at the time of operation a Sewer Mining Agreement with Sydney Water. Sydney Water will have a responsibility to notify APPF if any major changes to the catchment occur.

VWS will trend the relevant characteristics of the treated water to assess if any gradual or spike in changes occur. The graphs in appendix 4 represent the range of influent loading the treatment infrastructure is able to accept. Table below shows the limit values of the main hazards identified in the sewage that can be dealt with by the treatment infrastructure.

Hazard	Alert limits in raw sewage	Alert limit in trade waste
	230 mg/L	100 mg/L
Suspended solid	370 mg/L	600 mg/L
Ammonia	45 mg/L	100 mg/L
Nitrogen	50 mg/L	150 mg/L
Phosphorous	10 mg/L	50 mg/L
Oil & grease	50mg/L	Primary treatment: 110 mg/L Secondary treatment: 200 mg/L
TDS	550 mg/L	500 mg/L
Sulphate	30 mg/L	2000 mg/L

Based on grab sample analysis of the sewer undertaken by BLL in May 2009 combined with knowledge that there are no significant industrial contributors to the raw sewage, VWS has based its design for raw sewage quality being typical municipal sewage as follows.

Parameter	Units	Value
Oil & Grease	mg/L	42
Ammonia NH3-N	mg/L	45
BOD5	mg/L	200
pH		[6-8]
SS	mg/L	190
TN	mg/L	50
TP	mg/L	10
TDS	mg/L	550

Intended end uses, routes of exposures, receiving environments, endpoints and effects

- *Customers*
  The treatment infrastructure has only one customer; namely, JLL who will take the recycled water from the recycled water storage tanks shown on the P&IDs. The interface between the treatment infrastructure and our customer is described in detail in the IOP.

- *Routes of exposure*
  The scope of VWS is limited to the treatment infrastructure. During the water treatment inside the RWTP all the potential risks for continued water supply have been addressed during the design phase (refer to the IOP). The risks linked to the water quality are addressed later in the applicable sections of this Plan.
- *Receiving Environments and endpoints*
  The recycled water uses are out of VWS scope. The recycled water will have three different uses:
  - Cooling tower water and makeup
  - Toilet flushing
  - Garden irrigation

Inadvertent and unauthorised use of treated water

The inadvertent or unauthorised use of recycled water is the responsibility of JLL for APFF and is outside the scope of this Plan and VWS responsibility.

Accordingly JLL shall ensure there is no cross-connection between the recycled water piping network and any other network including drinking water network, which is prohibited under Regulation.

12.2.2 Recycled water system analysis

Summary actions:
- Assemble pertinent information and document key characteristics of the recycled water system to be considered.
- Assemble a team with appropriate knowledge and expertise.
- Construct a flow diagram of the recycled water system from the source to the application or receiving environments.
- Periodically review the recycled water system analysis.

Pertinent and key characteristics of the recycled water system

The RWTP will extract raw sewage from the Sydney Water main and treat it in 5 steps involving a moving bed biofilm reactor (MBBR), membrane bio reactor-filtration (MBR), reverse osmosis (RO), Ultra Violet light (UV) reactor and chlorination reactor. The treated water will provide up to 50kL per day for irrigation and toilet flushing, and 116kL per day for cooling water tower water make-up. Waste streams including sludge from the bioreactors and reject brine from the RO unit will be returned to the sewer.

Team with appropriate knowledge and expertise

The experienced team dedicated to Darling Quarter is detailed below:

	Member	Title	Qualification	Relevant Experience
Commissioning	Karen Shaw	Strategic Manager	Chemical Engineer	Fifteen plus years in water and wastes water treatment.
	Ines Fernandez-Rousselot	Process Engineer	Biological Process Engineer	Specialist in waste water technologies
	Clement Grech	Project Manager	Mechanical Engineer	Experience in asset management, operations and maintenance of wastewater
	Inshan Sheriff	HYDREX Manager	Chemical Engineer	10 years experience in operation, optimisation, maintenance and design of wastewater and water systems.
Operations	Peter Gendle	Operations Manager		33 years experience in wastewater and water plant commissioning and operational management for municipal and industrial plants.
	Jed Lindley	Service Manager		30 years experience in the water treatment industry.

Raian Teimourshahi	Electrical Engineer/ Controls	Electrical Engineer	Design representatives
Chow Leong	Operator		11 years experience in Waste water treatment. Advanced waste water Treatment Operator Level

Flow diagram of the recycled water system and review

A block diagram of the treatment infrastructure is provided in Appendix 3.

The entire process and its controls, including process flow diagram (PFD, Piping & Instrument Diagrams (P&IDs), 2D & 3D arrangement and electrical and controls drawings are detailed in the IOP Process.

The entire scheme, its design & construction and its operation & maintenance are subject to continuous review as required under Regulation and in accordance with VWS's own integrated management system (IMS) certified by BSI Global.

12.2.3 Assessment of water and sewage quality data

Summary actions:

- Assemble historical data about sewage, greywater or stormwater quality, as well as data from treatment plants and of recycled water supplied to users; identify gaps and assess reliability of data.
- Assess data (using tools such as control charts and trends analysis), to identify trends and potential problems.

Historical data and gaps

Flow analysis has been undertaken on the sewer (intermittently) between the dates of Jan 2009 and April 2010. This analysis shows there is sufficient flows within the sewer to provide a constant flow to the treatment plant, and the buffer storage volume provided in the system is adequate to ensure 24/7 plant operation. Please refer to Appendix 4 for sewage analysis.

Assess data and trending

As the treatment infrastructure continues to operate over time, historical data will be collected and stored by way of the SCADA system. Such data will be assessed and trends identified to enable optimisation of plant performance.

12.2.4 Hazard identification and risk assessment

Summary actions:

- Define the approach to hazard identification and risk assessment, considering both public and ecological health.
- Periodically review and update the hazard identification and risk assessment to incorporate any changes.
- Identify and document hazards and hazardous events for each component of the recycled water system.
- Estimate the level of risk for each identified hazard or hazardous event.
- Consider inadvertent and unauthorised use or discharge.
- Determine significant risks and document priorities for risk management.
- Evaluate the major sources of uncertainty associated with each hazard and hazardous event and consider actions to reduce uncertainty.

Approach to hazard identification and risk assessment

VWS is committed to good Risk Management (RM) principles and methodologies by application of the policies and procedures contained in its BSI Global certified integrated management system (IMS) and applied at every stage of project delivery from tendering through project management, contract

management, design, procurement, construction, commissioning, operations, servicing and maintenance.

Importantly VWS is committed to the approach and methodology provided by AS/NZS ISO 31000:2009 Risk management; Principles and Guidelines and related standards for managing disruption related risk and operational continuity as further described in the RSMP.

The stepwise approach and methodology addressed in detail in the RSMP are in line with the methodology under Element 2 in AGWR1 and summarised below:

- Define categories of adverse events and circumstances (risks) both external and internal
- Identify adverse events and circumstances for each category
- Consider the probability (likelihood) of each adverse event or circumstance occurring
- Consider the consequence of each adverse event or circumstance should these occur
- Evaluate the likelihood and consequence of each adverse event or circumstance and decide whether treatment is necessary to reduce the likelihood or to mitigate the consequence or both
- Decide on an appropriate risk treatment
- Repeat the evaluation process following risk treatment selected to assure that the risk treatment provides sufficient mitigation and control
- Repeat the process if necessary to arrive at an acceptable risk treatment
- Put the risk treatment in place, then manage and monitor.

The risk matrix below ranks the likelihood of an adverse event or circumstance occurring increasing from rare, to unlikely, possible, likely to almost certain; and the consequence of such event or circumstance increasing from insignificant to minor, moderate, major or severe as the case may be.

Likelihood or Probability	Consequence or Impact (Risk outcome)				
	Insignificant	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost Certain	High	High	Extreme	Extreme	Extreme
Likely	Medium	High	High	Extreme	Extreme
Possible	Low	Medium	High	Extreme	Extreme
Unlikely	Low	Low	Medium	High	Extreme
Rare	Low	Low	Medium	High	High

The priority of the actions and controls put in place shall be proportional to the level of risk identified in order that the residual risk becomes acceptable.

Qualitative assessment rating of controls

The higher the residual risk rating the greater the significance of that risk and the higher priority given to its prevention and or mitigation as applicable.

Once we put in place actions and controls to mitigate the consequence of an adverse event, we then reassess that mitigation to assure ourselves the control in place reduces the residual risk rating to an acceptable level (medium or low).

Review and update

This hazard identification and risk assessment will be reviewed and maintained in accordance with Document Management (Control) procedure in IMS-PR-QMS-001

Identification and risk assessment

The hazard identification has been carried out throughout the whole life of the project: inception and process development, design, procurement, construction, commissioning, operations, servicing and maintenance.

Inception and process development
The treatment process will provide the following level of treatment in line with AGWR1 requirements for toilet flushing, cooling tower make-up and irrigation purposes:

- 6.5 log removal for viruses
- 5 log removal for bacteria
- 5 log removal for protozoa

The process was developed from concept offer to BLL at the tender stage of the D&C contract:

- Moving Bed Biofilm Reactor (MBBR):
  Biological treatment process to remove Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), ammonia and nitrogen.
  This technology permits high loading conditions without any problem of clogging, and permits a small footprint. With the associated biofilm, media and sieves negate the need to recirculate sludge.
- Membrane Bio-Reactor (MBR):
  A standard filtration unit that separates treated water through immersed membranes. This achieves the removal of most of the suspended matter and related COD.
- Reverse Osmosis (RO):
  Reduce the Total Dissolved Solid (TDS) of permeate below 100 mg/L and reject 99% of the salt contained in the water. It is based on a maximum TDS level of 1,000 mg/L and is associated with an Antiscalant and Clean In Process (CIP) system.
- UV unit:
  Provides the recommended optical transmission (UVT) and 4 log reduction in Giardia and Cryptosporidium.
- Chlorination:
  For additional disinfection.

This process is monitored by a full remote access monitoring system (SCADA).

Continuing operation, servicing & maintenance
The risk management of adverse events and circumstances that may arise during operations and maintenance of the Treatment Infrastructure are addressed in full in the combined Retail Supply Management Plan for the Treatment Infrastructure (RSMP).

Water Quality
For the water quality, the catchment area has been identified as low risk domestic. The following table outlines both external and internal hazards.

Category	Likelihood of occurrence	Consequence of occurrence	Risk Rating	Acceptable Outcome (Y/N)
External Context (from sewage)				
Suspended solids	Almost certain	Catastrophic	Extreme	No
Bacteria	Almost certain	Catastrophic	Extreme	No
Protozoa	Almost certain	Catastrophic	Extreme	No
Viruses	Almost certain	Catastrophic	Extreme	No
Ammonia	Almost certain	Catastrophic	Extreme	No
Nitrogen	Almost certain	Catastrophic	Extreme	No
Phosphorous	Almost certain	Catastrophic	Extreme	No
Sulphate	Almost certain	Catastrophic	Extreme	No
Oil & Grease	Almost certain	Catastrophic	Extreme	No
Prohibited Substances to sewerage:				
Glass, aquarium gravel & Kitty litter	Possible	Major	Extreme	No
Diapers, sanitary items & clothing	Possible	Major	Extreme	No
Cooking fats & oils	Possible	Major	Extreme	No
Flammables incl petrol & explosives	Possible	Major	Extreme	No
Stormwater & swim pool overflow	Possible	Major	Extreme	No
Chemicals, paints, thinners	Possible	Major	Extreme	No
Metal, plastics or any trade waste	Possible	Major	Extreme	No
Internal Context (from within the Infrastructure)				
Water Treatment Chemicals	Possible	Moderate	High	No

The risk treatment (including preventative measures) of these above hazards is addressed under the next section wherein critical control points are also addressed.

12.3 Element 3 - Preventive measures for recycled water management

Components:

- Preventive measures and multiple barriers
- Critical control points

12.3.1 Preventive measures and multiple barriers

Summary actions:

- Identify existing preventive measures system-wide for each significant hazard or hazardous event, and estimate the residual risk.
- Identify alternative or additional preventive measures that are required to ensure risks are reduced to acceptable levels.
- Document the preventive measures and strategies, addressing each significant risk.

Preventive measures – existing and proposed

Water source protection

Proposed measures are addressed herein given this is a new scheme. The water source is a SWC Sewer; the catchment area has been identified as residential, commercial and retail, with no significant industrial loading. APPF have a Sewer Mining Agreement in operation with SWC. SWC is responsible to notify APPF if any major changes to the catchment occur (i.e. new industrial user).

VWS will trend the relevant characteristics of the treated water to assess if any gradual or spike changes in sewage characteristics occur.

Water treatment

The treatment process design has been developed with the following objectives by way of primary, secondary and tertiary treatment; refer to block flow diagram in Appendix 3:

- To easily achieve the required treated water quality for proposed use
- To be easily pre-validated by Department of Health and IPART
- To be easy to operate
- To be efficient and cost effective to maintain and operate
- To provide a safe and clean environment in which our maintenance and operations staff will work
- To have a responsible approach to odour and noise prevention

Storage/treatment

Two treated water storage tanks are provided, one of 50m^3 and the other 100m^3. These storage tanks are fitted with level control and are interconnected. These are enclosed concrete tanks, and therefore are not subject to daylight or any light source which may promote algae growth. These tanks can be topped up or replenished with potable water in the event of discontinued supply from the RWTP.

Protection and maintenance

Protection and maintenance of distribution systems and storages includes:

- Buffers zones:
  Equipment inside sealed plant room.
- Light:
  The RWTP is in a closed underground room, with no light. There will therefore be no risk of algal growth due to light.
- Drainage:
  All chemicals on site are stored within bunded areas. A system of drainage has been set up for the RWTP floor. This way the overflows from the tanks can fall on the floor and be cleaned up by the sump pumps, which are automatically switched on.
- Backflow prevention and cross-connection control:
  Cross-connection outside the RWTP is JLL's responsibility. For the cross-connection inside the plant, air gaps have been set up between potable water pipes and treated water storage tanks, so that there is no risk of backflow of treated water in the potable water pipes.
- Restrictions on usage by customers:
  The distribution of recycled water to end users is outside VWS scope of work. JLL is responsible for providing water to end users.
- Users of recycled water:
  The VWS RWTP provides water to its customer interface for the purpose of cooling tower, toilet flushing and irrigation.

Multiple barriers

The following multiple barriers to microbial pathogens have been designed as points in the scheme which shall be controlled and monitored to ensure adequate treatment and responsible management of recycled water. These barriers are as follows:

1. Barrier 1:
   Membrane Bioreactor

2. Barrier 2:
   Reverse Osmosis
3. Barrier 3:
   Ultraviolet disinfection
4. Barrier 4:
   Chlorination

Barriers 1 – 4 are VWS Critical Control Points (CCPs) for the scheme and the process steps which provide the pre-validated disinfection (reduction of virus, bacteria and pathogens) across the scheme.

12.3.2 Critical control Points

Summary actions
- Assess preventive measures throughout the recycled water system to identify critical control points.
- Establish mechanisms for operational control.
- Document the critical control points, critical limits and target criteria.

Definition (AGWR1)

A CCP is defined as an activity, procedure or process where control can be applied, and that is essential for preventing hazards that represent high risks or reducing these to acceptable levels. CCPs require:

- Operational parameters that can be measured, and for which critical limits can be set to define effectiveness (eg chlorine residuals for disinfection)
- Operational parameters that can be monitored sufficiently and frequently to reveal any failures in a timely manner (eg online and continuous monitoring of key treatment processes) — in some cases timely may mean monitoring regularly rather than frequently (eg backflow prevention audits)
- Procedures for corrective action that can be implemented in response to deviation from critical limits.

Assess preventive measures and identify critical control points

For clarity two types of critical points have been adopted by VWS for the Treatment Infrastructure:

- *Critical Control Points (CCP)*
  Process points identified to control water quality health hazards.
- *Critical Operational Points (COP)*
  Points identified to control hazards affecting continuity of supply.

CCPs and COPs are managed using the same protocols except for reporting of excursions. CCPs and COPs monitor and identify failures of the particular barriers that would result in the residual risk of a hazard increasing above the acceptable level identified in the risk assessment. Each barrier that was identified as a control in the risk assessment needed to be assessed for its criticality for controlling the specific hazard by applying the CCP decision tree in the AGRW1.

The following table illustrates the measures taken to remove viruses, protozoa and bacteria and the associated CCPs and COPs.

Critical Process	Hazard Controlled	Virus	Bacteria	Protozoa	Validation Information Source
1. MBR	Virus, Bacteria, Protozoa	1	3	3	Montgomery Watson Harza proved more than 5 log removal of inherent total and faecal coliforms and more than 3 log removal of inherent total Coliphages. California Department of Health Services (CDHS) Title 22 credit 1 log removal for the 50th percentile of MS-2 virus applicable for Puron™ MBR from Koch Membrane System (KMS). On this basis our approach is to claim the minimum of the predicted range for this process step (i.e. 3.0 log removal for bacteria, Protozoa and 1 log for viruses.
2. RO	Virus, Bacteria, Protozoa	1.1	1.1	1.1	Membrane supplier projections and performance guarantee.
3. UV	Virus, Bacteria, Protozoa	0.5	4	4	USEPA (2006) Ultraviolet Disinfection Guidance Manual for LT2 ESWTR reports that 4 log removal of Cryptosporidium and Giardia at UV intensity of 22 mJ/cm2 and 0.5 log removal of viruses at UV intensity of 39 mJ/cm2 for low pressure UV lamps at 254 nm are achieved. Our proposed UV system is Aquafides 1AF400T UV disinfection unit and provides a UV dose greater than 40 mJ/cm2 (400 J/m2). This has been certified by ÖNORM M5873-1C and provides the optical transmission (UVT) of the water is greater than 80% at 254nm.
4. Chlorine dosing	Virus, Bacteria, Protozoa	4	4	0	Published information by USEPA (2003) LT1ESWTR Disinfection Profiling and Benchmarking on log reduction vs C.t (concentration x contact time). Free chlorine concentration between 0.2-2 mg/L with temperature higher than 10 degrees and CT greater than 20 mg.min/L to achieve 4 log removal of viruses.
Total		6.6	12.1	8.1	
Required		6.5	5	5	

Establish mechanisms for operational control

Critical limits and target criteria

The critical limits of the CCPs have been identified and detailed in the next section below. This shows the performance selected for each CCP, and the target criteria to be met for the infrastructure to operate safely in microbiological and quality terms.

Supporting programs are taken by the operator to reduce the likelihood of failure of a control (barrier/critical process) or other management actions to reduce water quality hazard occurrence.

These actions or programs include but are not limited to:

- Controlling the quality of chemicals used in the treatment process.
- Monitoring and maintaining integrity of a barrier by periodic evaluation, tracking history and a pro-active replacement program.
- Regular verification and calibration of water quality analysers
- Maintenance programs suited to the criticality of each process, which may be more frequent than manufacturer direction.

The O&M manuals referred to in the IOP elaborate further.

Document the critical control points, critical limits and target criteria

CCPs, limits and target criteria are summarised below and addressed further under Elements 5&10.

Critical Control Point Identifier	Process Treatment Barrier
CCP 1	Membrane Bioreactor (MBR)
CCP 2	Reverse Osmosis
CCP 3	UV Disinfection system
CCP 4	Chlorination – storage tanks

CCP excursions

A CCP excursion is defined as the excursion of a critical alarm set point defined for the parameter being monitored at that point. All critical control/operational points are monitored by parameters that are measured online and alarms can be generated in real time using the supervisory control and data acquisition (SCADA) system.

Each critical control/operational point has both alert and alarm set points. If the alert set point is triggered the SCADA system will issue a priority 2 alarm to the operator on duty. The duty operator needs to follow the CCP response procedure and work instructions specific to that critical point to investigate and rectify the reason for the alert limit being triggered.

Triggering an alert limit does not amount to a non-conformance as alert limits are set with the purpose of allowing an operator to rectify a potential problem before a non-conformance can occur. COP/CCP and QOP/QCP alerts will be recorded using the SCADA system historian and the duty operator‘s records of rectification actions in the operator‘s logbook.

When an alarm set point has been triggered, a priority 1 alarm will be issued via the SCADA system. The duty operator needs to follow the CCP response procedure and work instructions specific to that critical point to investigate and rectify the reason for the alarm. In most cases the rectification action may involve a switch to a back-up process unit but in some cases supply of purified water may be stopped.

The corrective actions taken by the operator will be recorded in the operator‘s logbook and advised to the operators manager. All external water quality sampling non-conformances will be reported and reviewed for excursion spike, corrective action implementation.

CCP non-conformances
The control of the MBR, Reverse Osmosis, UV system and Chlorination Critical Control Points has been designed to shut down if a critical alarm set point has been exceeded. These can only be considered non-conformances if the corrective action designed to shut the process unit down has failed.

Failure to shut down a process that has triggered a critical alarm set point could mean that there is a possibility that water quality hazards may be present in the treated water, even if such hazards are not detected by water analyses, as water sampling only provides a very discreet snapshot of water quality at a certain point in time. Potential failure to control a hazard is the essence of the definition of a CCP non-conformance. Water quality analysis results will be monitored against performance.

CCP Incidents response:
- Alarm triggered.
- Notification (electronic)
- Online monitoring of performance.
- Evaluate / Reset alarm / reset plant
- Identify parameter / excursion / fault
- Determine / Implement response
- Corrective action
- Ongoing - Escalate to Manager if corrective actions were not affective
- Critical and quality control points are generally monitored online by using surrogate parameters that measure the performance of a process unit and can be related to how that process would perform on the parameters posing water quality hazards

On line monitoring
Each online analyser used for operational monitoring provides output signals which are sent to the plant supervisory control and data acquisition system (SCADA) via programmable logic controllers (PLCs). The operator can then see all results of online analysers which can be trended against time and displayed on the computer screens linked to the SCADA system. Operators can also receive alarms if an analyser records readings outside set points via the SCADA system and these can be used to trigger an audible alarm, alarms sent as via SMS to mobile phones or simply displayed on the computer screens.

Part of the operator‘s duties is to continually monitor the RWTP via the SCADA system. This is done by viewing SCADA screens that have been set up to show process units or sections of process units with a combination of equipment displayed. The Operator can also view trended information from analysers, flow meters and other instruments, review weekly NATA approved testing analysis results from the plant.

Each critical control monitoring parameter will be trended on the SCADA system and alert and critical alarm set points will be programmed to generate alarms that will display on the SCADA screens and can also be also relayed to mobile communication devices such as mobile phones.

The process manager and process engineers have defined reports that the SCADA system can generate on a regular basis which summarise information for review. The Process Commissioning plan addresses all the critical and operational control point parameters that will be trended by the SCADA.

12.4 Element 4 - Operational procedures and process control

Components:
- Operational Procedures
- Operational Monitoring
- Operational Corrections
- Equipment Capability and Maintenance
- Materials and Chemicals

12.4.1 Operational procedures

Summary actions
- Identify procedures required for all processes and activities applied within the whole recycled water system (source to use).
- Document all procedures and compile into an O&M manual

Identification and documentation of procedures
The IOP contains reference to the schemes detailed O&M manuals and servicing requirements.
Operational responsibility of VWS
The treatment infrastructure will be operated by VWS under contract to JLL as the Network Operator and Retail Supplier; this will include all normal daily routine maintenance tasks. The plant is designed to allow remote operational support and will not be manned 24/7.

An operator will be on site on a weekly basis. The plant will be automatically controlled via monitoring of critical control points through the PLC and SCADA system.

When any of the monitoring results fall outside of the designated safe operating band an automatic alarm will be sent to a designated operator/service engineer.

24/7 support will be provided under the contract with VWS, with a service engineer ensuring a responsible approach to out of hours support.

Included in the operations contract with VWS, is the supply of chemicals and consumables.

Operational responsibility of JLL
There is a hardwired communication between the Water Treatment Plant PLC and the Building Management System (BMS) alerting building maintenance staff to issues within the RWTP.

It will be the responsibility of JLL to manage, monitor and maintain the odour treatment system, including changing of the activated carbon on the filters as required.

It will be the responsibility of JLL to report any issues they may become aware of regarding the treatment infrastructure as soon as they occur, these issues may include noise, odour, unauthorized persons entering the plant room etc.

12.4.2 Operational monitoring

Summary actions
- Develop monitoring protocols for operational performance of the recycled water supply system, including the selection of operational parameters and criteria, and the routine analysis of results.
- Document monitoring protocols into an operational monitoring plan.

Observation and measurement
Operators shall attend site weekly to check the good operation of the RWTP. These inspections will allow making sure the SCADA system (see section 2.5) is working properly and effectively. The operator will be able to see if there is any problem undetected by the online monitoring on the water recycling process, equipment, data, or quality.

Aim of operational monitoring
Operational monitoring is used to confirm that preventive measures, implemented to control hazards, are functioning properly and effectively. Data from operational monitoring will be used as triggers for immediate short-term corrective actions to protect recycled water quality or to prevent increased risk to health or environmental health.

Selection of operational parameters
As addressed in previous sections, critical control points for the treatment infrastructure are as follows:

- MBR filtrate turbidity
- Reverse Osmosis permeate conductivity
- UV status
- Treated water chlorine residual value

All of these and other control parameters will be continuously logged by the plant PLC with the data being recorded locally and accessible from the SCADA system. They will also be tested regularly by a sample process described later.

Analyse results
This data can then be downloaded and reviewed by VWS engineers.

Documentation
Those monitoring protocols will be developed in the operations and maintenance manuals. The data will also be kept through the SCADA monitoring system for future use including plant optimisation.

12.4.3 Operational corrections

Summary actions
- Establish & document procedures for corrective action where operational parameters are not met.
- Establish rapid communication systems to deal with unexpected events.

Procedures for corrective actions
There will be some automatic plant responses to correct changes in operation or monitored water quality. For example an automatic CIP for the membranes will be triggered on high differential pressure across the membranes being monitored; higher chlorine dose will be applied on low residual chlorine being monitored.

Rapid communication systems
As addressed in the above paragraphs, the plant is able to be continuously monitored remotely providing the ability to respond to alarms and unexpected events either immediately remotely or by rapid response of service engineer being despatched to site to deal with the matter.

12.4.4 Equipment capability and maintenance

Summary actions
- Ensure that equipment performs adequately and provides sufficient flexibility and process control.
- Establish a program for regular inspection & maintenance of all equipment, including monitoring.

Adequate performance and reliability
All Treatment Infrastructure equipment and devices have been selected for reliability, flexibility and ease of operation and maintenance from prequalified reliable VWS suppliers (including our own Veolia proprietary equipment). In the development of the design and construction design and constructability reviews further support this assurance. Construction installation integrity verification and commissioning validate the above. The design of the treatment infrastructure ensures:

- Online measuring devices monitor critical operational parameters continuously
- Automated responses to changes in water quality are alarmed to a service engineer (on call 24/7)
- Necessary back up equipment is provided to minimize unplanned plant shutdowns
- Automatic adjustment of process parameters where appropriate (i.e. flow controlled chemical dosing, automatic cleaning of membranes when deterioration on performance is detected)

- A safe and clean environment is provided for our maintenance and operations staff to work in, including adequate bunding and safe chemical storage and handling equipment.

Regular inspection and maintenance

Please refer to the O&M manual for scheduling of daily, weekly, monthly, bi-annual and annual maintenance inspection and planned maintenance activities.

Service and maintenance records are kept on the VWS shared drive.

This ensures the following:

- All tasks are performed at the correct time interval
- No maintenance task will be missed
- All necessary parts and consumables necessary for completion of the planned maintenance are on hand prior to service personnel attending site.
- Service personnel will be available to complete the necessary works
- Close monitoring and review of all service tasks performed will form the basis for review of service requirements with any additions to the scope of works being discussed both internally and with the client prior to being instated.

For the Darling Quarter a maintenance log will be updated each site visit performed by a VWS engineer. This will contain all relevant information on the tasks performed during the visit including;

- All maintenance checks as per appendix (of the Operational Proposal)
- Any other maintenance tasks performed
- All operating data manually collected
- A log of chemical usage and chemical deliveries required

12.4.5 Materials and Chemicals

Summary actions
- Ensure that only approved materials and chemicals are used.
- Establish documented procedures for evaluating chemicals, materials and suppliers.

Approved materials and chemicals

VWS only uses approved chemical suppliers, and provides some of the chemicals from its own in house chemical supply division. Continuity of supply is guaranteed with approved back up suppliers nominated and pre-checked.

Other chemicals such as paints and sealants that come into contact with water will be selected to assure no contamination occurs.

Documented procedures for evaluating suppliers and products

The procurement process followed VWS procurement procedure except that prequalification of suppliers and the seeking of competitive pricing were generally waived for the major items of equipment and devices based on equipment being either nominated as Veolia proprietary or suppliers already on VWS approved supplier database.

All products and materials used in the recycled infrastructure will comply with the standards and codes noted in the AGWR1

- AS/NZS 3500 (*Plumbing and Drainage* 2003)
- AS/NZS 4020 (*Testing of Products for Use in Contact with Drinking Water* 2005)
- WASS Sewerage Code Version 2.1 (WASS 2002a)
- WSAA Water Supply Code (Dual Water Supply Supplement Version 1.1) (WSAA 2002b)

Refer to Element 5 for NATA testing of water for quality compliance.

12.5 Element 5 - Verification of recycled water quality and environmental performance

Components:

- Recycled water quality monitoring
- Application site and receiving environment monitoring
- Documentation and reliability
- Satisfaction of end users of recycled water
- Short term evaluation of results
- Corrective responses

12.5.1 Recycled water quality monitoring

Summary actions

- Determine the characteristics to be monitored
- Determine the points at which monitoring will be undertaken
- Determine the frequency of monitoring

Characteristics to be monitored

The characteristics of the recycled water will be monitored and logged throughout the process via the automatic monitoring system and external quality analysis

The parameters for verification testing are based on the AGRW1. Parameters are in the table below.

Parameter	Value or Range	Monitoring
BOD5 Suspended Solids	<5 mg/L <5 mg/L	Composite Composite
pH	6.0-9.0	Online
Turbidity	<0.3 NTU	Online after MBR
E. Coli	<1cfu/100mL	Grab sample
Cl residual	0.2 - 2.0 mg/L	Online after treated water tank
Coliphages	<1pfu/100mL	Grab sample
Clostridia	<1cfu/100mL	Grab sample
TDS	<100mg/L	Online post RO

Sampling and analyses procedures and work instructions for all sampling of various streams for onsite and external analyses. Onsite sampling and analyses procedures have been developed taking into account best practice as outlined in the Standard Methods for the Examination of Water and Wastewater (21st edition APHA/AWWA) and AS/NZS 5667.1:1998 Water quality-Sampling.

External laboratory analyses are performed by laboratories that have obtained NATA certification.

Sampling of sewage will also take place initially at commencement and thereafter based on change in plant treated water quality performance.

Frequency of monitoring

1. Ongoing operational testing is on a rolling basis, for the weekly and monthly grab samples we are required to do; i.e. week 1 – test on Monday, week 2 – Tuesday etc to include weekend days.
2. The plant is designed for remote access for operational monitoring, and will have 24/7 support alarms at all times.

According to the Australian Guidelines for Water Recycling (Phase 1) the following tests will be performed

Parameter	Value or Range	Sampling Frequency
BOD5	<5 mg/L	Monthly
Suspended Solids	<5 mg/L	Monthly
pH	6.0-9.0	On line
Turbidity	<0.3 NTU	On line
E. Coli	<1 cfu/100mL	grab samples . Weekly
Chlorine residual	0.2 mg/L-2.0 mg/L	On line
Coliphages	<1 pfu/100mL	grab samples. Weekly
Clostridia	<1 cfu/100mL	grab samples Weekly
TDS	<100 mg/L	grab samples Monthly

Monitoring points

In addition to the above sampling and testing the following CCP points will be monitored and data collected from on line instrumentation:

Critical Control Point Identifier	Process Treatment Barrier
CCP 1	Membrane Bioreactor (MBR)
CCP 2	Reverse Osmosis
CCP 3	UV Disinfection system
CCP 4	Chlorination – Storage tanks

All these critical control points are monitored online using surrogate parameters that measure the performance of a process unit and can be related to how that process would perform on parameters that pose a water quality health hazard.

The following table represents the CCP surrogate parameters which will be closely monitored using online instrumentation, which is enabled to automatically shut down the plant in the event of any change of effluent quality outside the allowable range.

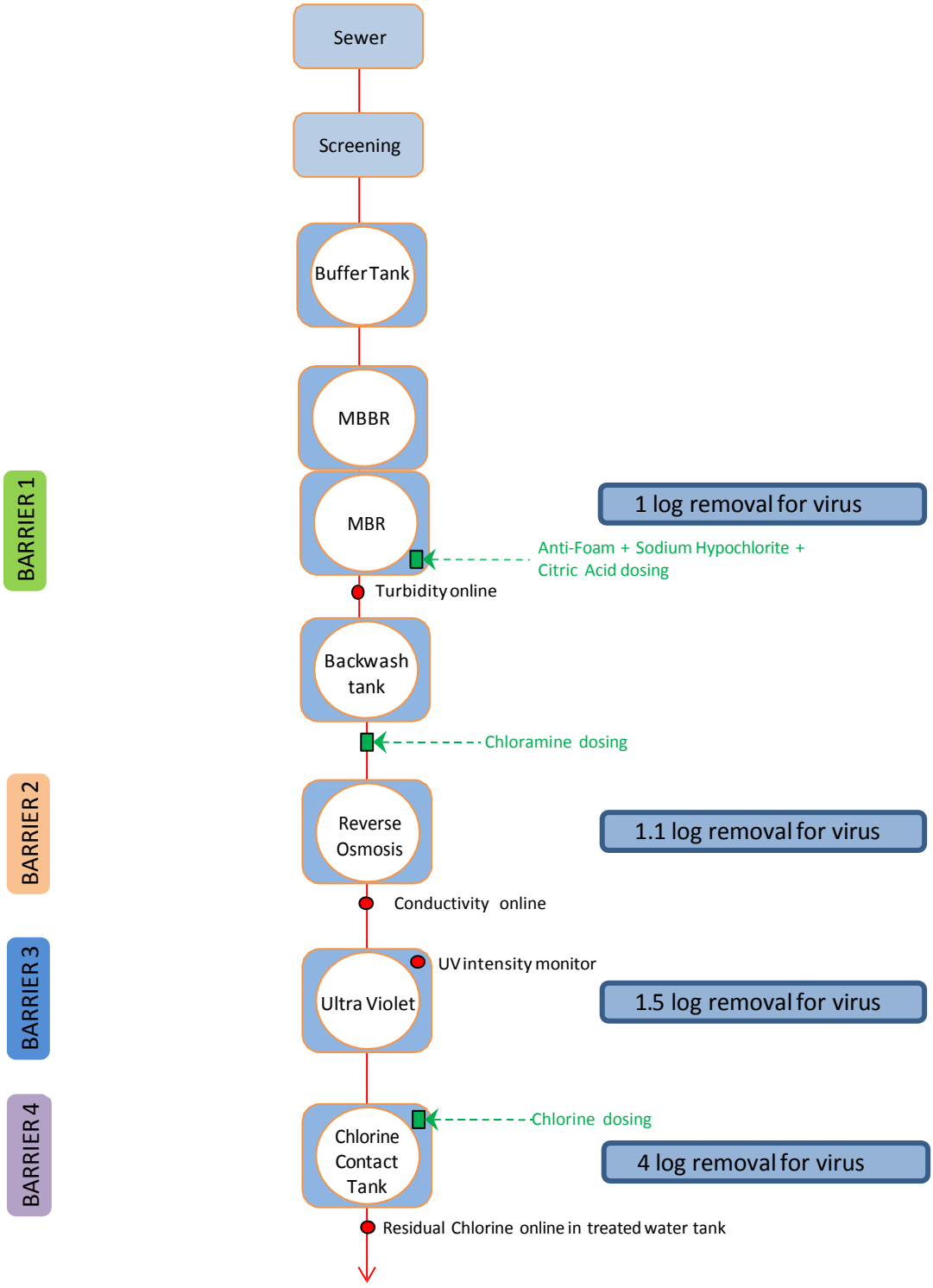
VWS also monitored the recycled water quality in the storage tanks, to validate the quality of the water provided to the customer.

JLL is responsible for monitoring the recycled water quality after the water is taken from the storage tank to end users.

Critical control point	Hazards (log removal credit)	Potential critical limits	Monitoring	Corrective actions
Microfiltration	Viruses (1), bacteria (3), cryptosporidium/Giardia (3), nitrogen	Combined filtrate turbidity < 0.2 NTU for 95% of the time and <0.5 NTU for 100% of the time	Monitored on-line post the MF unit Automatic alarm to operator at alert limit Automatically close valve to treated water storage at high alert limit	Automatically shut down supply to treated water tank at upper limit and divert treated water to sewer
Reverse Osmosis	Viruses (1.1), bacteria (1.1), cryptosporidium/Giardia (1.1)	Conductivity: [20-50]* µS/cm	Monitored on-line pre- and post-RO unit Automatic alarm to operator at alert limit Automatically close valve to treated water storage at high alert limit	Automatically shut down supply to treated water tank at upper limit and divert treated water to sewer
UV disinfection	Viruses (0.5), bacteria (4), cryptosporidium/Giardia (4)	UV intensity > 40mJ/cm^2 Lamp age: <12 months	Monitored on-line Automatic alarm to operator at alert limit Automatically close valve to treated water storage at high alert limit	Automatically shut down supply to treated water tank at upper limit and divert treated water to sewer
Chlorination	Viruses (4), bacteria(4), protozoa	Free chlorine after the treated water tanks: 0.2-2mg/L	Monitor on-line/residual chlorine Automatic alarm to operator at alert limit Automatically close valve to treated water storage at high alert limit	Automatically shut down supply to treated water tank at upper limit and divert treated water to sewer

*based on RO feed conductivity to achieve 1.1 log

Control Critical Points & Sample Points Diagram



Ongoing Operational Monitoring

The ongoing performance testing for normal operations of the RWTP is based on continual monitoring of our CCP's and will be as follows:

Parameter	Value or Range	Sampling
pH	6.0-9.0	On line
Turbidity	<0.3 NTU	On line after MBR
Chlorine residual	0.2 - 2.0 mg/L	On line
Conductivity	< 160 µS/cm	On line after RO
UV Intensity	> 40mJ/cm^2	On line
E. Coli	<1/100mL	1 grab sample per week

Calibration of on line monitoring instrumentation will be undertaken in line with the manufacturers' recommendations (or more frequently) and is documented on our IOP.

In addition to the on line monitoring we will undertake the following grab samples at a minimum monthly frequency, as a system performance check. Unless stated otherwise the sampling point will be post chlorination (i.e. treated effluent).

Parameter	Value or Range	Sampling
BOD5	<5 mg/L	1 grab sample per month
Suspended Solids	<5 mg/L	1 grab sample per month
E. Coli	<1 cfu/100mL	1 x grab sample per week
Coliphages	<1 pfu/100mL	1 x grab sample per week
Clostridia	<1 cfu/100mL	1 x grab sample per week
TDS	<100 mg/L	1 x grab sample per month

12.5.2 Application site and receiving environment monitoring

Summary actions

- Determine the characteristics to be monitored and the points at which monitoring will be undertaken.

VWS does not propose to monitor the receiving environment; this is the responsibility of JLL

12.5.3 Documentation and reliability

Summary actions

- Establish and document a sampling plan for each characteristic including location and frequency ensuring monitoring data is representative and reliable.

The table below provides a summary of the log reductions that will be validated across the Treatment Infrastructure. It should be noted that the actual log removal across most of these barriers may be higher than that stated below, however the values proposed are those which can be validated for the process using available on-line measurements or surrogates.

Process Step	Log Removal Credit Viruses	Log Removal Credit bacteria	Log Removal for Cryptosporidium & Giardia
Membrane Bioreactor (Puron™ MBR)	1	3	3
Reverse Osmosis	1.1	1.1	1.1
UV System (Aqufides 1AF400T)	0.5	4	4
Chlorination[1]	4	4	0
Total	6.6	12.1	8.1
Required Log Removal (source AGWR1)	6.5	5	5

1. Chlorination will be required at the treatment infrastructure to achieve treated water quality requirements with respect to total nitrogen, thus free chlorine residual will be achieved at the plant's treated water tank.

A very conservative approach to validation has been undertaken, particularly in terms of virus removal. There are additional process barriers within the Treatment Infrastructure which were not considered as CCPs because they were not specifically designed to control health hazards within the Infrastructure. However, these barriers can and do remove health hazards and are often considered for log removal credits when used in typical water treatment applications.

Additionally, the validation process relies on online verifiable results to demonstrate a log removal across a critical point. The critical points identified within the RWTP has been assessed in documents such as the Australian Guidelines for Water Recycling as providing significantly more bacterial, protozoan and/or viral log removal than can be demonstrated on an ongoing basis using available online instruments.

12.5.4 Satisfaction of users of recycled water

Summary actions
- Establish an inquiry and response program for users of recycled water, including appropriate training of people responsible for the program.

This is the responsibility of the JLL.

12.5.5 Short-term evaluation of results

Summary actions
- Establish procedures for the short-term review of monitoring data and satisfaction of users of recycled water.
- Develop reporting mechanism internally and externally, where required

Maintenance activities will be entered onto the site electronic maintenance log located on the service Jdrive. The frequencies and references to enable adequate monitoring of historical data, preventive maintenance activities and due time frames are used to generate a prioritized task list for maintenance personnel. Any identified breakdown maintenance tasks will be immediately entered and prioritized. Upon completion of tasks, maintenance personnel record the task as completed.

The recording and analysis of historical operating and maintenance costs and performance data for assets is an important element in asset management planning.

External reporting to JLL by VWS as per the service agreement. VWS shall also report as required by IPART Network Operators' Reporting Manual under the Water Industry Competition Act 2006, Water — Reporting Manual, May 2010.

12.5.6 Corrective responses

Summary actions
- Establish and document procedures for corrective responses to non conformance or feedback from users of recycled water.
- Established rapid communication systems to deal with unexpected events

Refer to Element 4.3, namely as follows.

There will be some automatic plant responses to correct changes in operation or monitored water quality. For example, automatic chemical cleaning (CIP) of the MBR membranes may be triggered on receipt of a high-high differential pressure reading. Other automatic corrections are detailed in the O&M Manual; a review of the Piping & Instrumentation Diagrams (P&IDs) immediately indicates which instrumentation is alarmed for either automatic correction or human intervention.

The plant is able to be continuously monitored remotely providing the ability to respond to alarms and unexpected events either immediately, remotely or by rapid response of service engineer being despatched to site to deal with the matter.

12.6 Element 6 - Management of incidents and emergencies

Components:
- Communication
- Incident and emergency response protocols

Emergency: An event that arises internally, or from external sources, which may adversely affect the occupants or visitors in a facility, and which requires an immediate response. (as per AS 3745 – 2010)

Emergency management

The twelve generic specific steps for the response, notification, management including recovery, reporting and investigation of all incident types are contained in Appendix 1. The RSMP, the Operations & Maintenance Manuals and VWS's IMS address all other incidents and minor emergencies and their management.

Emergency prevention

The measures taken to eliminate the incidence of emergencies are:

JLL	VWS
Maintenance and servicing of appliances, alarm systems Drill for DQ Induction training	Maintenance of plant and equipment (including system alarms) Correct storage practices Good house keeping Training Participation in the general DQ evacuation drill

Emergency Preparedness

The arrangements made to ensure that, should an emergency occur, all those resources and services that are needed to cope with the effects can be efficiently mobilised and deployed are:

JLL	VWS
Defined Emergency Planning Committee (EPC) Appointed Emergency Control Organisation (ECO)	Training in the emergency management and arrangements

Emergency Mitigation

Measures taken to decrease the likelihood of emergencies occurring and the associated impacts on people, the facility and the environment are:

- Plant and equipment shutdown procedures
- Display of emergency evacuation diagrams
- Display of key contacts list
- Provision of communication equipment
- Remote SCADA monitoring
- Provision of PPE
- Provision and maintenance of spill response kits

Emergency Response

The Emergency Response steps that are to be followed in the event of an emergency are listed in Appendix 1. VWS has an overarching crisis management Chart (PR-OHS-012) available in IMS.

Emergency contacts

A list of contacts is available in Appendix 2 and is displayed on site.

Roles and Responsibilities

The responsibilities of the following personnel relate to emergency preparedness and response.

ROLE	FUNCTION
Operations Manager - Services	• Ensure this Plan is kept current and up to date • Ensure this plan is distributed and made available to all personnel working in association with the Darling Quarter RWTP and associated network including VWS staff, JLL staff, all subcontractors and visitors to the plant are made aware of this plan's existence and application in the event of an emergency. • Ensure necessary PPE and spill kits are available at the RWTP site to effectively manage each of the identified potential emergencies. • Ensure that personnel working in association with the RWTP are adequately trained in their duties • Ensure that VWS and JLL stakeholders in the contacts list are made aware of this plan
Service Manager	• Distribute this plan and make it available to all personnel working in association with the Darling Quarter RWTP and associated network including VWS staff, JLL staff, all subcontractors and visitors to the plant are made aware of this plan's existence and application in the event of an emergency. • Arrange necessary PPE and spill kits are available at the RWTP site to effectively manage each of the identified potential emergencies. • Train personnel in their duties • Ensure that personnel working in association with the RWTP participate in practice drills • Follow through corrective actions arising from emergencies
Plant Operator / Service Engineer	• Make sure this plan is available on site • Wear appropriate PPE • Receive training in the use of a spill kit

ROLE	FUNCTION
	• Report incidents to building and VWS management • Participate in practice drills • Maintain relationship with the building management • Implement this plan in the event of an emergency • Ensure the contact list is displayed on site

Public and Media communication strategy

In the event of media interest, the following rules apply:

- Site to be closed to all persons other than VWS and JLL Management, Emergency Services, Police and Government officials
- Media to be barred from site
- No comments whatsoever are to be made to the media by any employee except by the appointed Marketing Specialist

12.6.1 Communication

Summary actions

- Define communication protocols with the involvement of relevant agencies and prepare a contact list of key people, agencies and stakeholders.
- Develop a public and media communications strategy JLL ERP & JLL Security

Communication protocols with relevant agencies and stakeholders

The appendix contains a list of Agencies, Stakeholders and contact details of those who need to be advised and or be responsible for taking specific action in the event of an incident or emergency. The communication between agencies needs to happen on several levels as outlined below: NOTE: JLL's incident and emergency procedures will not take into account the "Notifications" required under the WICA License.

- Regulatory
- Contractual
- Operational
- Customer related

12.6.2 Incident and emergency response protocols

Summary actions

- Define potential incidents and emergencies and document procedures and response plans with involvement of relevant agencies.
- Train employees and regularly test emergency response plans.
- Investigate any incidents or emergencies and revise protocols as necessary

Potential incidents and emergencies

The most critical potential incidents have been determined through a risk assessment and summarised below.

Emergency events that may occur in connection with VWS's operations and maintenance of the RWTP are:

Type of emergency	Event / scenarios	Consequences
Human	Injury, illness	Medical treatment required

Type of emergency	Event / scenarios	Consequences
	Bomb threat	Evacuation of building
Natural	Localised flooding Earthquake Fire	Plant failure, local evacuation
Technological	Fire Power disruption Chemical spill Loss of containment UV / chlorination failure Illegal discharge of contaminants Loss of PLC/SCADA system	Biological hazard, chemical hazard, fumes, odour Water specifications not met

Training

Employees will be trained in emergency response and incident protocols. Emergency response plans will be regularly reviewed and practised. It is noted that such activities improve preparedness and provide opportunities to improve the effectiveness of plans before an emergency occurs.

Response, Investigation and reporting

Whenever an incident occurs, whether it is related to WHS, Environment, Quality Operations, Contractual or Regulatory and whether it is a serious occurrence involving harm or damage to the environment or property or a near miss, we respond appropriately to all incidents immediately and take the necessary corrective actions to restore safety and the like per protocols and then investigate and report accordingly, followed by taking the preventative actions recommended in the report to avert a future occurrence. Our Incident response, investigation and reporting procedures are certified by BSI Global as are all our systems and procedures to:

- AS/NZS 4801:2001 OHS Management Systems
- BS OHSAS 18001:2007 OHS Management Systems
- AS/NZS ISO 14001:2004 Environmental Management Systems
- AS/NZS ISO 9001:2008 Quality Management Systems

We are audited annually for continuing certification and every three years for recertification.

Notification

VWS commits to compliance with IPART's publication: Water Incident Notification by Network Operators and Retail Suppliers, November 2012 (refer).

12.7 Element 7 - Operator, contractor and end user awareness and training

Components:

- Operator, contractor and end user awareness and involvement
- Operator, contractor and end user training

This section addresses awareness and training for operators, contractors and end users of recycled water systems. The importance of this is recognised, because the knowledge, skills, motivation and commitment of operators, contractors and end users ultimately determine:

- A recycled water supplier's ability to successfully operate a water supply system and maintain the exclusion barriers used for preventive measures, and
- The effectiveness of end-use restriction barriers used as preventive measures.

12.7.1 Operator, contractor and end user awareness and involvement

Summary actions

- Develop mechanisms and communication procedures to increase operator and end user awareness of, and participation in, water quality management and environmental protection.

The Infrastructure Operating Plan (IOP) makes reference to the Treatment Infrastructure Operations and Maintenance (O&M) manuals. These O&M procedures (noted in Element 4.1 in Section 12 above) and services procedures are supplemented by job specific Safe Work Method Statements (SWMSs) as required under the WHS Regulation.

Operators and contractors

All operators and contractors will be properly inducted onto the site by JLL to ensure understanding and compliance of site OHS and Environmental rules and obligations. They shall be made aware of:

- VWS recycled water quality policy
- The principles of risk management
- Characteristics of the recycled water supply system
- Regulatory and legislative requirements
- Their roles and responsibilities
- How their actions can affect water quality, and public and environmental health.

End users

Customers will be made aware of their own obligations and water management by way of their contracts, website information and community consultation as per the JLL Non-Drinking Water Management Plan. As a minimum all end users shall be made aware of:

- Restrictions on use of recycled water
- Management requirements that are essential to ensure the sustainable use of recycled water
- Any practice that could threaten human or environmental health.

12.7.2 Operator, contractor and end user training

Summary actions

- Ensure that operators, contractors and end users maintain the appropriate experience and qualifications.
- Identify training needs and ensure resources are available to support training programs.
- Documents and maintain of all the training sessions.

Appropriate qualifications and experience

VWS engages only persons qualified and experienced to perform duties prescribed in their employment contract which also sets out their position description, duties, authorities and performance indicators. Each employee attends a formal annual individual performance appraisal that also identifies their training requirements based on the requirements of their role and career goals. All new employees are inducted according to the VWS Policy which will provide employees with an

understanding, among others, of:

- Company policies;
- WHS and environmental duties and obligations under relevant legislation
- WHS and environmental controls;
- Applicable legislation;
- Emergency response;
- Responsibilities
- Levels of authority.

Safety and emergency training is provided to all employees as well as standard Company training including Manual Handling and Respect in the Workplace. Specific health and safety training is provided for specific task and activities including high risk work.

Veolia Water is committed to ensuring workers are deemed competent to perform the tasks assigned to their positions. We have linked competencies to positions and in turn to people, and use a software program to capture this information. The program alerts managers (at a pre-determined time) when an employees certification or competency is due to expire, allowing managers to program training to suit the individual and business's needs.

Our management system defines our training and competency procedures and competency records are maintained. Operators undertake on-the-job training for a minimum of 100 hours as per industry standards and hold licences in accordance with relevant statutory requirements.

JLL's specific induction for site/project related hazards will be provided and include topics such as:

- Risk assessment
- Emergency Preparedness and response
- Relevant site or project specific hazards related to:
    - Chemicals
    - Mobile Plant
    - Rotating equipment
    - Pressure
    - Excavations and trenches
    - Hot work
    - Traffic
- Environment and community requirements
- Incident reporting

This induction will be delivered prior to commencement.

Management training is also provided and is an excellent foundation for developing people management skills. Managers who have attended this training and who have some people management experience will move on to attend an internally developed Coaching and Counselling' course to further enhance their skills in this area.

Competencies and training

VWS provides a dedicated services team having the necessary specialised skills and competencies to service the Treatment Infrastructure. These necessary skills and competencies are only achieved through specialised training and experience within and by VWS Australia.

The competencies required or related to servicing the Treatment Infrastructure are listed below:

Module
Basic Water System Awareness
Closed Water Systems Treatment
Boiler System Treatment
Biological Treatment
Carbon Filtration
Ultra Violet Disinfection
Multimedia Filtration
Reverse Osmosis
Chemical Dosing and Control
Chemical Service Breakdown Support
Process Engineering experts

Each of these specialised competency modules require a multitude of skills attained only through VWS Australia training in a structured and managed way as follows:

- Theory sessions of applicable operations
- Practical sessions of applicable operations
- Competency assessment of theory and operations
- Experience - perform > 10 routine applicable services (accompanied)
- Experience - perform > 10 applicable services (unaccompanied)
- Practical - install replacement equipment and devices
- Practical - install & commission new equipment and devices
- Skills and competencies assessment of experience and practical

End User Awareness Training

VWS has information about end user awareness regarding recycled water on our website: www.myrecycledwater.com.au but as per the Non-Drinking Water Management Plan JLL are responsible for ensuring End User Awareness Training.

12.8 Element 8 - Community involvement and awareness

Components:

- Consultation with users of recycled water and the community
- Communication and education

12.8.1 Consultation with users and community

Summary actions

- Assess requirements for effective involvement of users of recycled water and the community.
- Develop a comprehensive strategy for consultation.

Assess requirements

JLL is responsible for developing a community stakeholder engagement and public education strategy on the use of Treated Recycled Water. They will be provided with the appropriate information they need to do so. JLL undertakes to provide the following stakeholder information in relation to the scheme:

- There will be tenant awareness of the water treatment plant as the plant will be specifically detailed in the properties —House Rules & Building User Guide and Fitout Manual.
- The plant and its operation will be nominated within service agreements for building services that it affects such as mechanical services, water treatment (cooling tower maintenance) and hydraulic maintenance agreements.

- The property will have regular Building Management Committee meetings. At these meetings items such as the properties sustainability is discussed and the property performance to the NABERS rating schemes (Energy, Water and Indoor Environment) are provided. Clearly the recycled water plant will have a major impact on the water performance of the property.
- JLL is responsible to undertake independent audits of the Recycled Water Management System these will be in addition to the Audits required by IPART, and will review the entire scheme from sewer off take, to end use points.
- The property owners Lend Lease APPF and Jones Lang LaSalle have an established Incident Management process. This starts with notification on site and then escalation through to senior management of Lend lease and Jones Lang LaSalle. We have established agreements in place with key service providers across all engineering and service disciplines that can be called upon to attend any incident. Jones Lang LaSalle also within its standard site operational documentation has manuals that specifically address service or system interruption / loss and the corrective actions that need to be enacted.
- Lend Lease APPF with JLL has a Risk Management Audit program across all assets where independent auditors attend and inspect the site. The scope of work for these audit inspections is covered under the areas of Environmental, Public Liability and Fire Life Safety. The recycled water plant will be addressed under the Environmental and Public Liability sections of this program.

Strategy for consultation

While VWS has its own communications team, VWS is not responsible for any project specific communication. VWS will engage directly with community groups if and when they are impacted by VWS's operational activities (e.g. noise, odour etc.).

12.8.2 Communication and education

Summary actions

- Develop an active two-way communication program to inform users of recycled water and promote awareness of recycled water quality issues.
- Provide information on the impacts of unauthorised use.
- Provide information on the benefits of recycled water use.

Active two-way communication program

Key messages are:

- Recycled water will undergo a high level of treatment and testing
- Management procedures are in place to ensure safety
- Recycled water can replace drinking water for many applications, so that every megalitre used in these schemes represents another megalitre saved from drinking water supplies
- Recycling can benefit the environment (eg by conserving water, protecting waterways and allowing dissolved nutrients to be reused in agriculture, thereby reducing the need for synthetic fertilisers).

Reference is made to Chapter 6 of the AGRW1, Consultation and Communication; typical two way communication program strategies will include but not be limited to the following:

- Surveys
- Stakeholder forums including schoolchildren and student education
- Private discussions
- Telephone hotlines
- Website
- Competent liaison personnel

Impact of unauthorised use

Unauthorised use of treated water is an important area health wise, environmentally and contractually. Education as noted above and emergency preparedness and response as addressed in 12.6.2 above are implicitly connected with this section. End user awareness is addressed by JLL in the Non-Drinking Water Management Plan.

Benefits of recycle water use

VWS has information about recycled water on our website: www.myrecycledwater.com.au

12.9 Element 9 - Validation, research and development

Components:

- Validation process
- Design of equipment
- Investigative studies and research monitoring

12.9.1 Validation of processes

Summary actions

- Validate processes and procedures to ensure they control hazards effectively.
- Revalidate processes when variations in conditions occur

Validation of the selected process was made internally by VWS process experts. Should design changes be required as the infrastructure ages the revalidation of the changes shall occur.

12.9.2 Design of equipment

Summary actions

- Validate the design of new equipment and infrastructure to ensure continuing reliability.

A validation plan was prepared in order to validate design and procedures to ensure these control hazards effectively. As the Treatment Infrastructure ages it may be the case that modifications to the infrastructure could be required in which case revalidation shall occur.

12.9.3 Investigation of studies and research monitoring

Summary actions

- Establish programs to increase understanding of recycled water supply system, and use this information to improve management of the recycled water supply system.

Investigation of studies and research monitoring by VWS will be carried out locally and non specifically by our R&D facilities in Europe where various works are performed in relation to recycle water production and reuse. Such local studies may include the following:

- Baseline monitoring of parameters or contaminants to identify water quality problems
- Developing early-warning systems to improve the management of poor water quality
- Event-based monitoring to determine the magnitude of impacts (duration and maximum concentrations)
- Examining chemical quality of sewage to identify potential sources of undesirable discharges
- Assessing trade-waste agreements to identify chemical contaminants that may be discharged into water sources
- Examining seasonal or outbreak impacts on microbiological quality of sewage and treated recycled water.

12.10 Element 10 - Documentation and reporting –

Components:

- Management of documentation and records
- Reporting

VWS is certified by BSI Global to the following standards noted in 12.6.2 for IMS in relation to all our

business activities, products and services.

VWS is audited annually by BSI for continuing certification and every three years for recertification. It follows that the requirements of this element are met by VWS certified management systems and procedures.

12.10.1 Management of documentation and records

Summary actions
- Document information pertinent to all aspects of recycled water quality management, and develop a document-control system to ensure versions are in use.
- Establish a records-management system and ensure that all employees are trained to complete records.
- Periodically review documentation and revise as necessary.

Document control

Documentation pertinent to all aspects of managing recycled water quality shall describe activities and include procedures, including detailed information on:

- Preventive measures, including target criteria and related critical limits
- CCPs, including specific operational procedures and criteria, monitoring and corrective actions
- Incident and emergency response plans
- Training programs
- Procedures for evaluating results and reporting
- Communication protocols.

Documentation is reviewed and maintained in accordance with our Document Management (Control) procedure in IMS (PR-QMS-001).

Records management

Documentation and records systems will be kept as simple and focused as possible. There should be sufficient detail to provide assurance of operational control, when coupled with a suitably qualified and competent operator or end user.

- The Infrastructure SCADA will provide the necessary operational records needed for complying operations monitoring and reporting.
- Our maintenance records shall provide the complying information needed for operational reliability.
- Audits and associated audit reports will provide conformance verification and any corrective actions required to ensure compliance.
- Incident reports including corrective actions, root cause analyses and preventative actions shall provide the necessary compliance records in this area.

Periodically review documentation and revise as necessary

Documents will be reviewed in accordance with the VWS Document management (control) procedure – PR-QMS-001.

Records of all activities will be accessible electronically and paper as necessary and protected from loss noting VWS has in place a certified disaster recovery system for electronic records. Paper records shall be maintained in offices with fire (smoke) detection and protection (fire extinguishers as a minimum).

12.10.2 Reporting

Summary actions
- Establish procedures for effective internal and external reporting.
- Produce an annual report aimed at users of recycled water, regulatory authorities and stakeholders.

Documenting performance and reporting

VWS performance will be reported internally and to the Customer and IPART:

Detailed operational performance data, service and maintenance logs with actual data as downloaded from the RWTP SCADA system will be made available upon request and annually in accordance with the Regulation and IPART Reporting Manual requirements for Network Operators (and Retail Suppliers).

12.11 Element 11 - Evaluation and audit

Components:

- Long-term evaluation of results
- Audit of recycled water quality management

Long-term evaluation of recycled water quality results and audit of recycled water quality management are required to determine whether original preventive strategies are effective and whether these are being implemented appropriately. This long-term evaluation allows performance to be measured against objectives and helps to identify opportunities for improvement.

12.11.1 Long term evaluation of results

Summary actions

- Collect and evaluate long-term data to assess performance and identify problems.
- Document and report results.

Data collection

Annually VWS will review the performance of the Treatment Infrastructure by way of the following with a view to identifying problem areas and optimising future operations:

- SCADA records and trends
- Audit reports

Reporting

Refer to 12.10.2 above for reporting protocols which shall also apply to long term data assessment.

12.11.2 Audit of recycled water quality management

Summary actions

- Establish processes for internal and external audits.
- Document and communicate audit results.

Internal and external audits

Internal audits

VWS shall prepare an audit schedule of its water quality management. VWS has a Compliance Group whose function is not only to support VWS business activities but as follows.

All VWS personnel must perform their duties lawfully and in accordance with our certified integrated management system (IMS) and under contract. Even so, all our business activities, products and services, including performing our core and support processes, carry a measure of risk.

It follows that we have a defined way of doing business to eliminate risk or mitigate risk to a level acceptable to the company. The procedures and approaches for this are contained in our IMS documentation; namely, our procedures include the applicable risk management tools and the level of checking and verification required to properly conduct our business.

Our Corporate Compliance Group has been established to provide a level of assurance to our stakeholders and top management (namely MD and GMs) that we are going about our business to meet our legal and contractual obligations, complying with our IMS procedures, mitigating our risks and meeting our corporate governance objectives as defined in our corporate policies.

This is largely achieved by the auditing process, for which there are three levels:

- Level 1 - third party IMS certification and third party financial accounting compliance audits,
- Level 2 - internal audits by our own auditors or consultants we engage as our own,
- Level 3 - audits of VWS by our customers or others; alternatively of our suppliers by VWS.

In addition to this assurance through audits, our Compliance Group provides a support function to management and staff in both our company's divisions, D&B and Solutions.

An audit schedule shall be prepared and implemented. Audit reports shall be prepared by the auditors including the documenting of any non conformance, observations or opportunities for improvement. Strict time bars will be placed on corrective actions and followed up accordingly to assure completion.

External audits
These may be by JLL, our customers and by IPART under WICA legislation.

JLL may prepare audits that are in line with the contracts between it and VWS. Customers would not normally audit but rely upon IPART audits for assurance of water quality and its management.

The Minister may at his discretion require IPART to audit more frequently than legislated.

Other audits will be carried out against the companion plans to this Water Quality Plan (refer Section 9)

Audit results
Audits shall be documents by way of formal reports. A schedule of non- compliance events will be maintained by VWS and submitted as part of the annual report to IPART including the following;

- List of non-conformances, opportunities for improvement and observations
- Date or period of non-compliance
- Nature non-compliance including a list of customers who have been affected.
- Reasons for non-compliance and root cause analysis
- Any remedial action required and actual/anticipated date of full compliance.

12.12 Element 12 - Review and continuous improvement –

Components:

- Review by senior managers
- Recycled water quality management improvement plan

VWS is committed to quality assurance across its business. This commitment is communicated through the VWS Quality and related Policies and the BSI Global certified VWS IMS.

12.12.1 Review by senior management

Summary actions
- Senior managers review the effectiveness of the management system & evaluate need for change.

The WHSEQ Team reports on environmental management for Executive Management Team meetings, the board reports, and via the IMS incident reporting feature following an audit or incident. Typically reviews include some or all of the following as applicable:

a) results of internal audits
b) evaluations of compliance with applicable legal and other requirements
c) communication from external interested parties, including complaints
d) our environmental performance overall
e) the extent to which objectives and targets have been met
f) status of corrective and preventative actions
g) follow-up actions from previous management reviews
h) changing circumstances, including
    1) changes in our activities, products and services

2) results of evaluation of environmental aspects from planned and new D&B
3) changes in applicable legal and other requirements
4) the views of interested parties
5) advances in science and technology
6) lessons learned from emergency situations and accidents

i) recommendations for improvement

Outputs from the review of the environmental management system could include decisions on:

- the suitability, adequacy and effectiveness of our EMS
- changes to physical, human and financial resources
- actions related to possible changes to our environmental policy, objectives, targets and other elements of our EMS

Records of management review can include copies of meeting agenda items, lists of attendees, presentation materials or handouts, and management decisions recorded in a memo to file, reports or minutes.

12.12.2 Recycled Water quality management improvement plan

Summary actions
- Develop a recycled water quality management improvement plan.
- Ensure that the plan is communicated and implemented, and that improvements are monitored for effectiveness.

Improvement plan development

At the completion of the first year of operation and maintenance by VWS under contract to JLL improvements will be considered, depending on plant performance to date and the following areas:

- Capital works
- Training
- Enhanced operational procedures
- Consultation programs
- Research and development
- Incident protocols
- Communication and reporting.

13 Implementation

The Licencee (VWS):

a) will ensure that this water quality plan is fully implemented and kept under regular review and, in particular, that all of its activities are carried out in accordance with this plan, and
b) will, if the Minister so directs, amend the plan in accordance with the Minister's direction.

13.1 Implementation

This Plan will be implemented by VWS on the day determined by IPART or the Minister.

Prior to the implementation of this Plan and in a timely manner as applicable to each stakeholder VWS will issue this Plan or make it available as applicable to all stakeholders. In the case of those VWS personnel responsible for implementing and administering this Plan, VWS will ensure those responsible are made fully aware of the obligations required under this Plan.

13.2 Amendments

Amendments to this Plan may include VWS improvements or those directed by the Minister.

This Plan may also be amended as may be necessary following outcomes of site inspections and audit findings by IPART, VWS, BLL, or any other authorised stakeholder

14 Compliance

If the Minister or IPART so demands or if any significant change is made to tis combined sewage management and water quality plan, the licensee (VWS):

a) will provide the Minister or IPART with a report, prepared by an approved auditor in such manner and form as the Minister or IPART may direct, as to the adequacy of the plan, or
b) will pay the Minister‘s or IPART‘s costs of conducting an investigation into the adequacy of the plan.

14.1 IPART audit

This Plan may be audited by IPART as addressed in section 12.11.2 above.

14.2 Other audits

This plan shall be audited by VWS as outlined in section 12.11.2 above

14.3 Audit outcomes

For IPART audits, following the submission of the final audit report, VWS may be required to take action to manage the audit outcomes; for example any corrective action requests (CARs). As prescribed in the IPART Audit Guidelines, IPART will discuss the process for addressing any issues and the actions that VWS should take in response to the audit findings on a case-by-case basis.

For VWS internal audits, VWS will take immediate applicable corrective action to any non- conformance, observation of opportunity for improvement followed by review and investigation as necessary to determine cause and then put in place preventative actions to avert any reoccurrence of the non-conformance.

For JLL audits VWS shall consider any audit non-conformances and the like and either challenge non conformances if not in agreement or otherwise take prompt corrective actions accordingly.

Appendices

The following appendices form an integral part of this WQP

Appendix 1	Incident management steps
Appendix 2	Emergency Contacts
Appendix 3	Process Block Flow Diagram
Appendix 4	Sewage analysis; appended
Appendix 5	Sewer mining exclusion zone map

Appendix 1 Incident management steps

The twelve steps in incident response, notification, management, recovery, reporting and investigation are tabled below; noting items 1-4 may occur in quick succession:

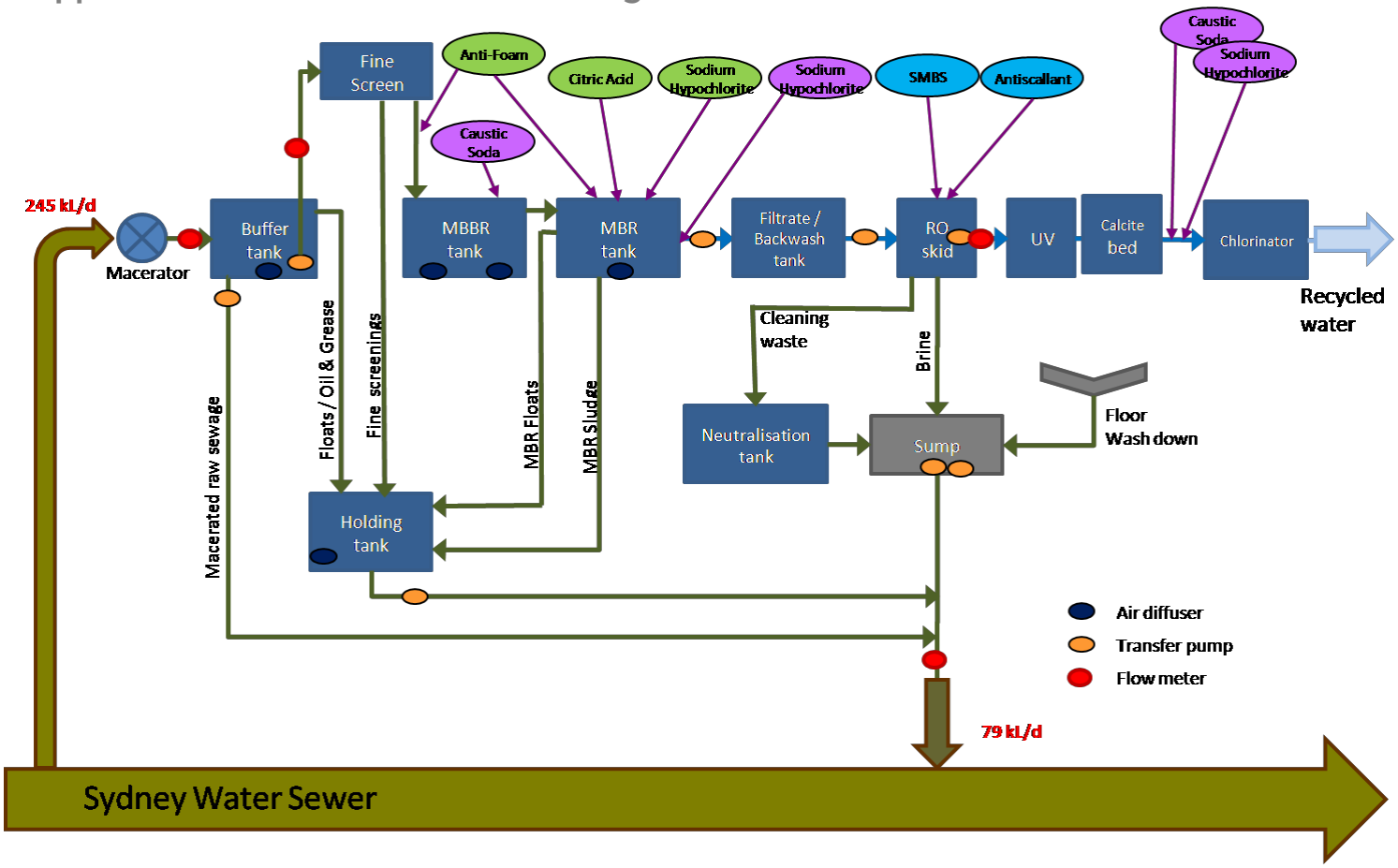
Step	Action	Responsible Person	Reference/Remarks
1	**Identify the Incident**. When incident is identified as a major emergency or crisis requiring Ambulance, Fire Brigade or Police phone 000 as soon as safe and practicable to do so	Service Engineer	Solutions Vest and WHSE training. All employees must be trained in the capability to identify and respond to an incident and determine if an emergency
2	**Protect yourself** and others; stay calm and respond as trained to respond.	Service Engineer	Wear Applicable PPE
3	**Identify any injured person(s)**, rescue as applicable and provide first aid as qualified.	Service Engineer	First aid training. Rescue training depending on conditions
4	**Take action** against further incidents as applicable to incident; eg isolate electrically, mechanically and hydraulically	Service Engineer	Items 2, 3 and 4
5	**Notify** internally: report Incident Internally once step 1-4 completed	Service Engineer	Refer contact list for Line and WHSE managers and in writing by input to VWS SharePoint intranet incident.
6	**Appoint an Incident Site Manager**. A number of trained candidates, usually Service Managers, are available in anticipation of an emergency.	General Manager appoints the Incident Site Manager.	The Site Incident manager manages using the particular incident management plan (ERP or SOP from O&MM)
7	**Escalate.** If the incident is a major or crisis emergency the WHSE Manager in concert with Legal Counsel decides how promptly the incident must be reported to senior management and the relevant authorities or other stakeholders (eg Ministers, IPART, WorkCover, affected parties).	General Manager WHSEQ	Follow the Crisis Notification procedurePR-OHS-012. Refer to Authority and Stakeholder in Contacts list
8	The Incident Site Manager immediately **takes responsibility** for the Incident Site. The Incident Site Manager secures the incident area, gathers and records as much information as possible in relation to the Incident including taking photographs, obtaining records of interview, and making relevant notes, and diagrams as soon as possible.	Incident Site Manager	Refer PR-OHS-011 and FM-OHS-318
9	**Recovery**: Take the necessary actions to recover normal operations by way of a recovery plan.	Operations Services team	As applicable to the severity of the incident and its consequences
10	**Appoint the Incident Communications Person** in the event of a major emergency or crisis.	This is the VWS Communications Manager unless noted otherwise.	Refer to the communications Plan overall and the communications strategy for each sub plan
11	**Appoint Internal Incident Investigator** within 24 hours after the Incident. The Internal Incident Investigator also collects and maintains all incident records and shall be the contact for WorkCover. The Internal Incident Investigation Manager conducts the investigation without fear or favour and prepares report on Form FM-OHS-318, determines root cause and required corrective actions in consultation with relevant personnel including Design. The time of any report shall not exceed 3 – 4 weeks.	General Manager	Refer PR-OHS-011 and FM-OHS-318
12	**Implement corrective actions**. Close Incident and record in the Incident reporting system when all actions have been certified as complete.	Operations Manager Services manages including appointment of subcontractors as may be needed.	Refer PR-OHS-011 and FM-OHS-318

Procedures & forms are located on the VWS SharePoint intranet.

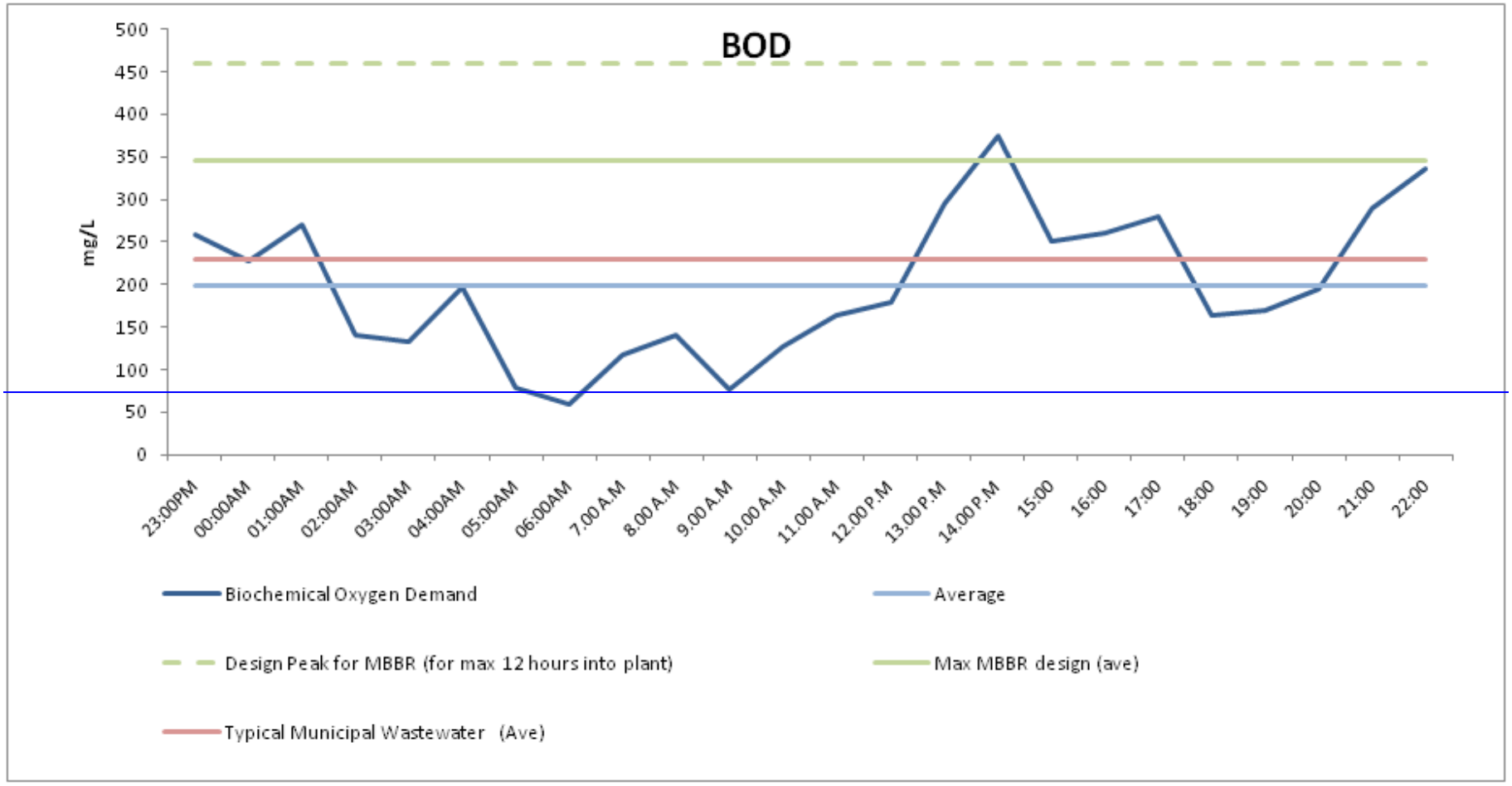
Appendix 2 Emergency Contacts

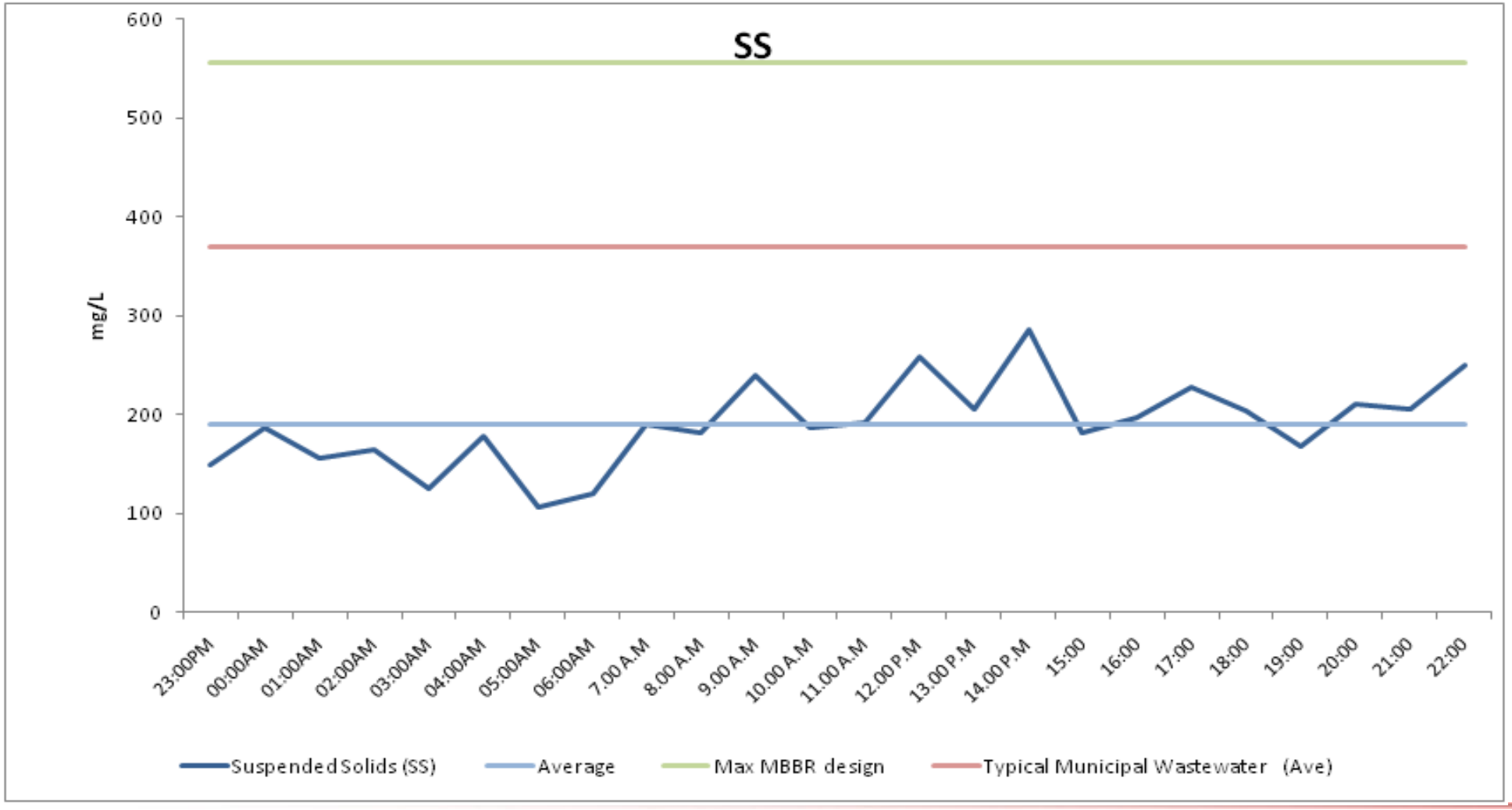
Organisation	Contact	Emergency Phone	Alternate Phone
NSW Ambulance	NA	000	NA
NSW Fire Brigades	NA	000	NA
State Emergency Services	NA	000	NA
NSW Police	192 Day Street, Sydney	000	9265 6499
Sydney City Council	Town Hall House, 456 Kent Street, Sydney	9265 9333	NA
St Vincent's Hospital	Victoria Street, Darlinghurst	8382 1111	NA
Sydney Hospital	Macquarie Street, Sydney	9382 7111	NA
Poisons Information Centre	NA	13 11 26	NA
WorkCover	NA	13 10 50	NA
IPART	Mr Gary Drysdale	9290 8400	NA
Office of Environment & Heritage (Previously the DECCW)		9995 5000 (HO Sydney)	4640 0500 (Local office)
Dept of Health (NSW health)	Public Health Officer	9515 9420	9515 6111
Minister for Finance and Services	Policy Officer L 18, 227 Elizabeth Street, Sydney	9372 8521	
VWS General Manager WHSEQ	Kurt Warren	0411 258 842	8572 0410
VWS Service Manager	Jed Lindley	0407 980 828	8832 4518
VWS Operations Manager	Peter Gendle	0438 880 291	8824 0213
VWS General Manager	Matthew Lee	0438 880 186	8572 0490
VWS Marketing Specialist	Ana-Maria Daza	NA	8572 0446
JLL Security	24 hours	8267 8210	NA
JLL Representative	John Scott	8267 8204	8267 8205 (Colin Begg)

Appendix 3 – Process Block Flow Diagram



Appendix 4 – Sewage analysis

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300
200
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00:00AM
01:00AM
02:00AM
03:00AM
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05:00AM
06:00AM
7.00 A.M
8.00 A.M
9.00 A.M
10.00 A.M
11.00 A.M
12.00 P.M
13.00 P.M
14.00 P.M
15:00
16:00
17:00
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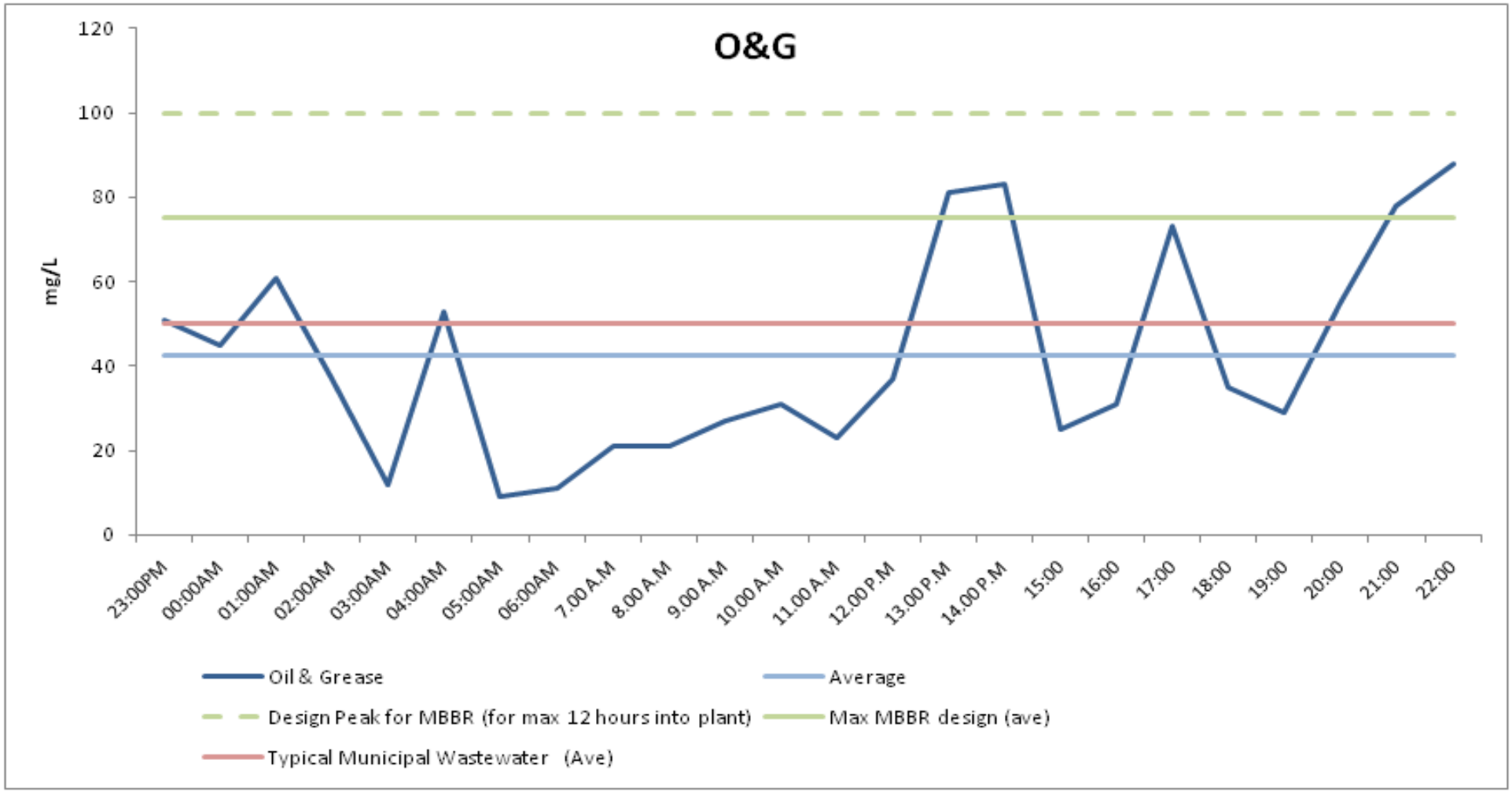
19:00
20:00
21:00
22:00
Suspended Solids (SS)
Average
Max MBBR design
Typical Municipal Wastewater (Ave)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mg/L
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100
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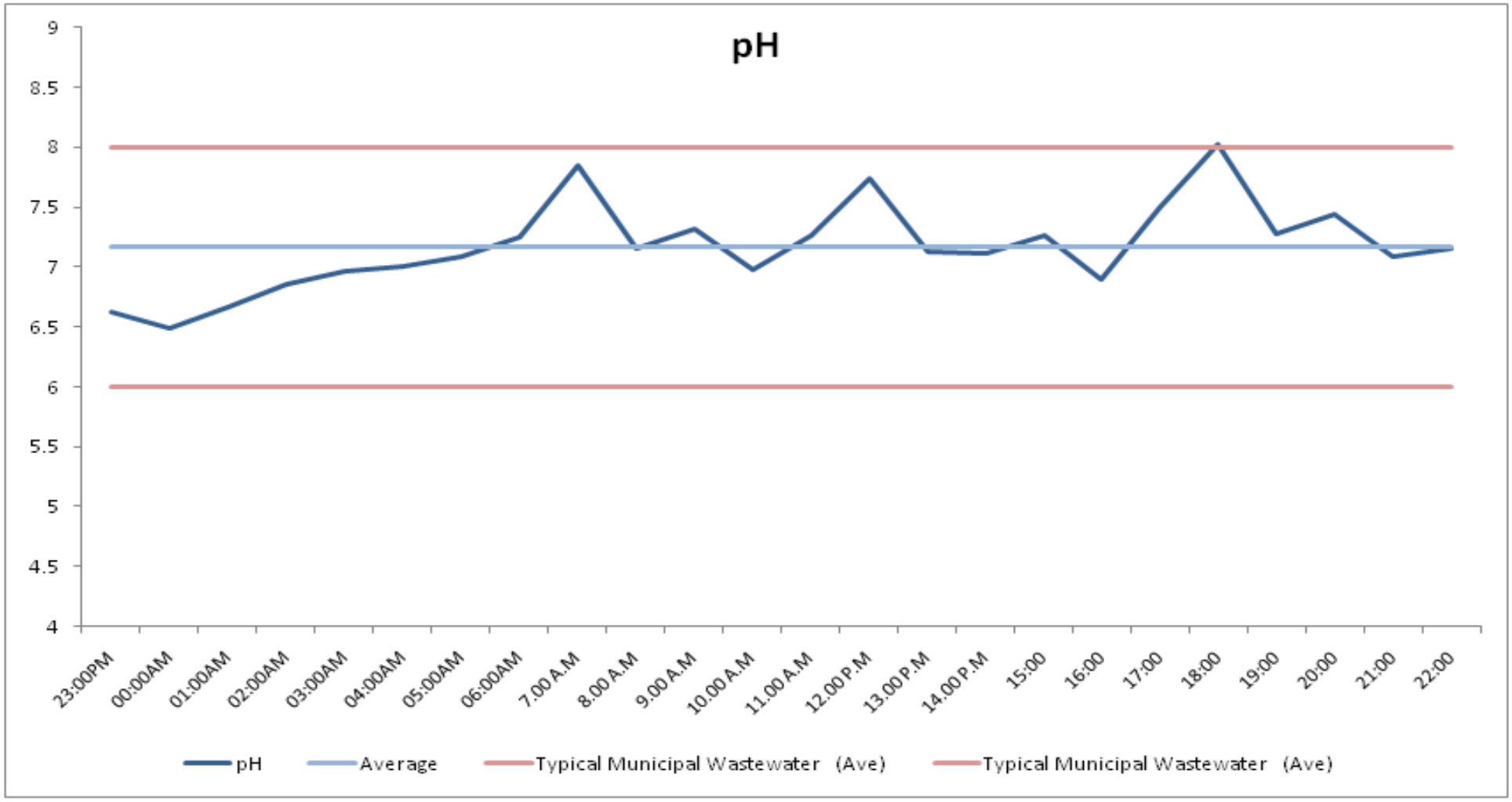
05:00AM
06:00AM
7.00 A.M
8.00 A.M
9.00 A.M
10.00 A.M
11.00 A.M
12.00 P.M
13.00 P.M
14.00 P.M
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
Oil & Grease
Average
Design Peak for MBBR (for max 12 hours into plant)
Max MBBR design (ave)
Typical Municipal Wastewater (Ave)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13.00 P.M
14.00 P.M
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
pH
Average
Typical Municipal Wastewater (Ave)
Typical Municipal Wastewater (Ave)

Appendix 5 – Sewer mining exclusion zone map